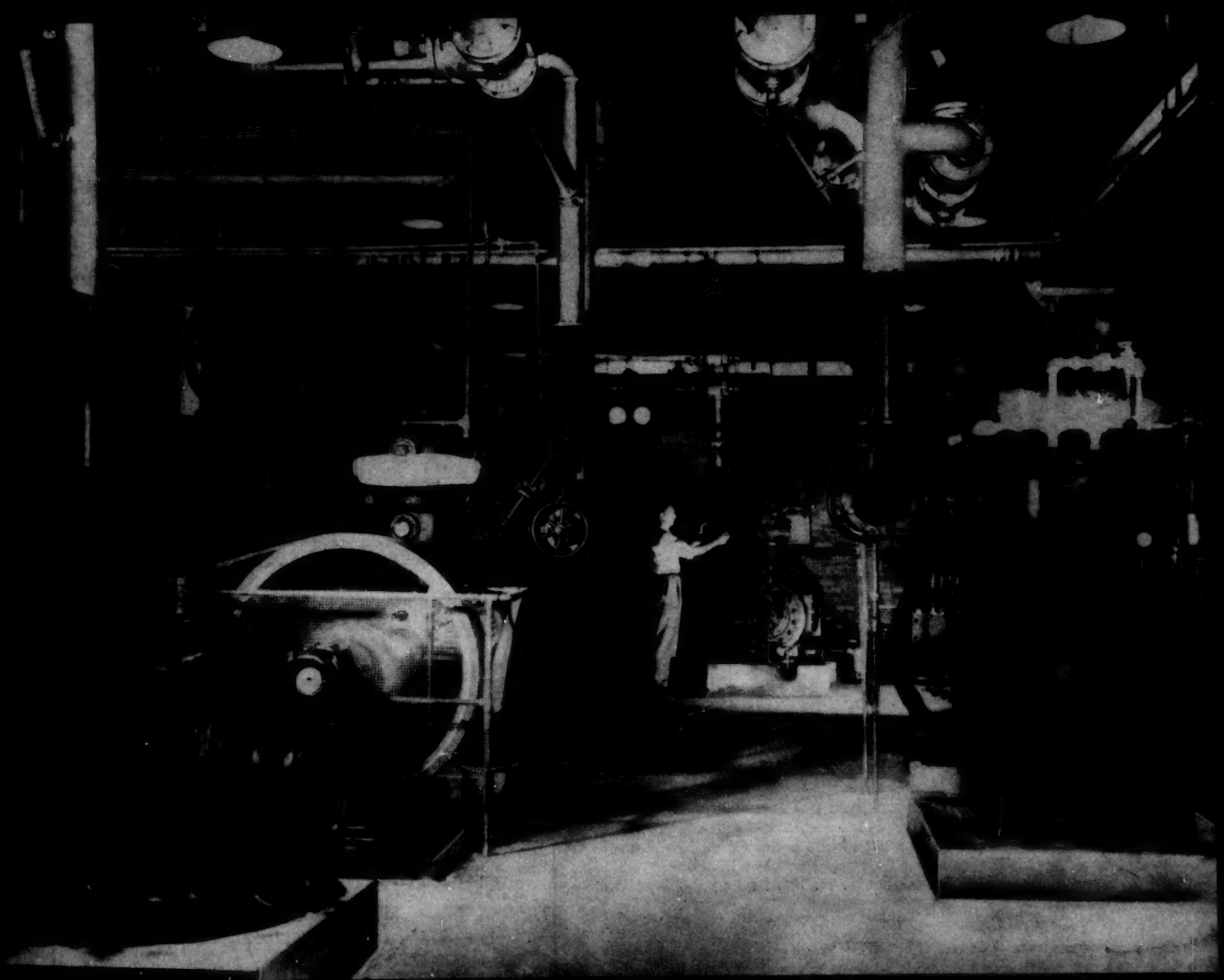
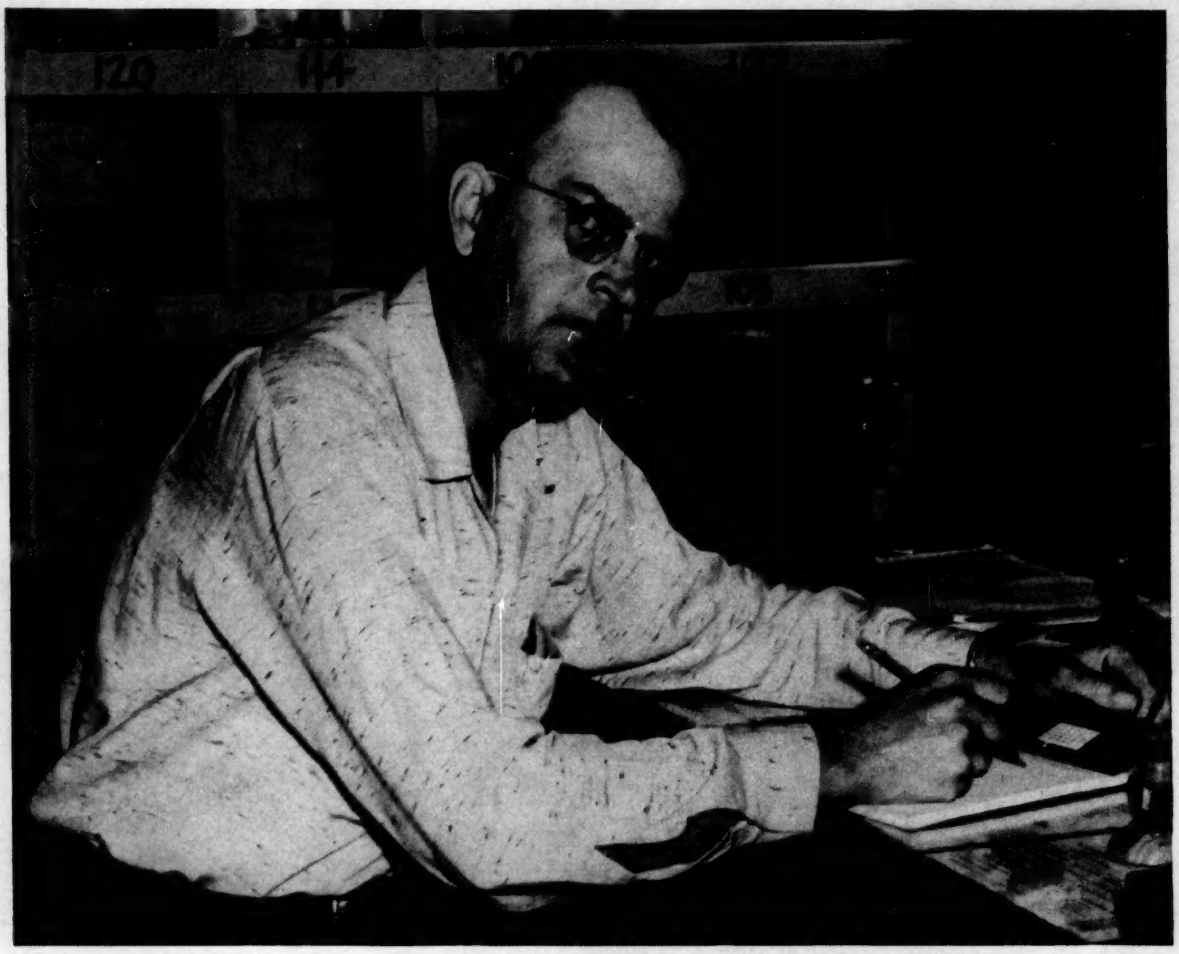
INDUSTRIAL REFRIGERATION





"Air-cooled condensers and Freon* have paid off big in our 162½-ton system"

. . . SAYS MAINTENANCE SUPERVISOR HAROLD VOGT, HANDY ANDY COMMUNITY STORES

"1,450 lbs. of 'Freon-12' plus air-cooled Kramer Trenton Unicon condensers are doing a big cooling job for San Antonio's Handy Andy No. 2," says Mr. Vogt. Harold Vogt is Maintenance Supervisor for Handy Andy Community Stores, a 19-store chain of Texas supermarkets. "We've got 100 tons of air conditioning and 62½ tons of refrigeration working at top efficiency with the same charge of 'Freon' we put in the system when it was built 2 years ago," continues Mr. Vogt. "We've never had any trouble with 'Freon.' It's been an excellent investment . . . the best refrigerant we could use."

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FOR MORE INFORMATION on the use and handling of "Freon" refrigerants write to E. I. du Pont de Nemours & Co. (Inc.), FREON® Products Division 264, Wilmington 98, Delaware.

Always ask for "Freon" from the wholesaler who displays this sign . . .

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•

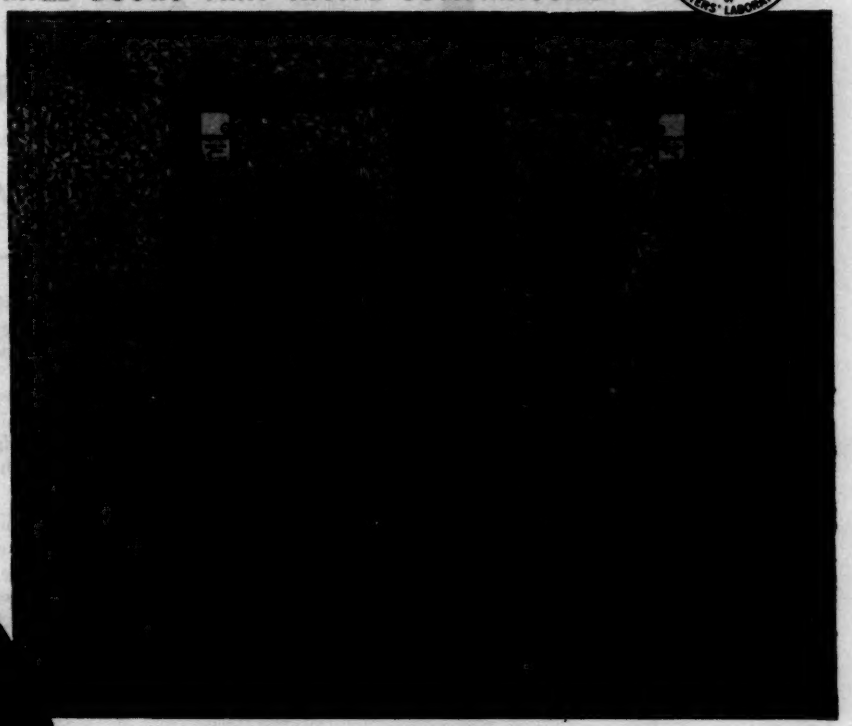
"SUPER CAM" NO. 34 ADJUSTABLE GRAVITY TYPE CLOSING HARDWARE.

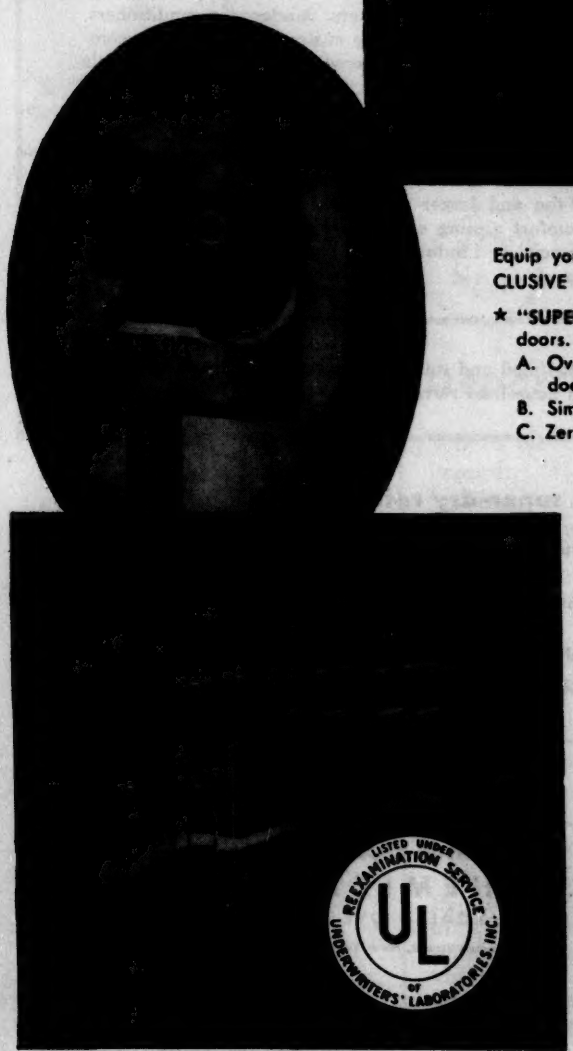
•

NO. 51 AUTOMATIC ELECTRIC DEFROSTERS WITH CALIBRATED THERMOSTAT CONTROL.

•

BUTCHER BOY "RUGGED" DOOR CONSTRUCTION FEATURING "X-TYPE" STEEL DIAGONAL BRACING FOR MAXIMUM STRENGTH AND MAXIMUM INSULATION.





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Industrial Refrigeration

April, 1957

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Number 4

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The Cover:

Four Frick Booster Compressors used by Rockingham Poultry Producers' Cooperative in connection with nine other high stage machines, to give this Shenandoah Valley Community refrigerating plant efficient and flexible refrigerating service. . .The plant provides utility refrigeration to an ice plant, apple storage, poultry freezing tunnels and a freezer temperature storage. Automatic controls cycle more important units as demanded, while standby compressors are brought on manually. Story starts on page 13.

What's New

MACHINERY
APPLIANCES • PROCESSES

Cold Storage Door Insulation Increased by Urethane Foam Weight is Reduced by Half

This artist's sketch shows how the urethane foamed-in-place construction reinforces and insulates door.

AN EASTERN cold-storage door manufacturer has introduced an automatic refrigerator door that weighs less than one-half as much as a conventional door, yet offers improved insulation and is structurally stronger.

Known to the trade as the Prest-O-Matic Cold-Storage Door, the key feature is insulation with urethane foam in a hull of galvanized steel, aluminum, or stainless steel. The foam has excellent insulation properties, yet weighs only a fraction of conventional materials. It is extremely durable and non-friable. Because the foam adheres equally well to metal or wood, it reinforces the unit, making possible a light-weight door while furnishing outstanding structural strength.

Cold-storage doors are subjected to vibration and jarring. Urethane foam, because it is cellular semi-rigid, withstands shock and will not crumble and sift to the bottom of the frame with age and rough usage. This assures longer, safer insulation life.

The lightness of the door permits an automatic operating device to work efficiently through countless thousands of cycles. The door opens and closes at speeds up to two feet per second, saving up to 75 per cent "open door time" thereby reducing refrigeration loss.

An additional feature of this new type door is a manual safety latch to prevent accidental trapping of workers in a refrigerated area. Defrosting units in the door gaskets assure positive sealing under any conditions of temperature and humidity.

This new door has been installed by many of the leading freezer and cold storage companies in the United States and Canada. In many companies, the urethane foam insulated doors are being specified when new plants are built or where old type doors have to be replaced.

Air Cooled Condenser Shown at Exhibit

ONE of the largest single unit air cooled condensers now available to the air conditioning and refrigeration industry was on display at the Krack exhibit during the Heating and Ventilating Exposition (Feb. 25-Mar. 1), at Chicago's International Amphitheater. The unit has a nominal capacity of 45 tons and is capable of delivering 31500 CFM to meet the most exacting demands of the trade, according to Refrigeration Appliances, Inc., Chicago manufacturers of Krack heat transfer appliances.

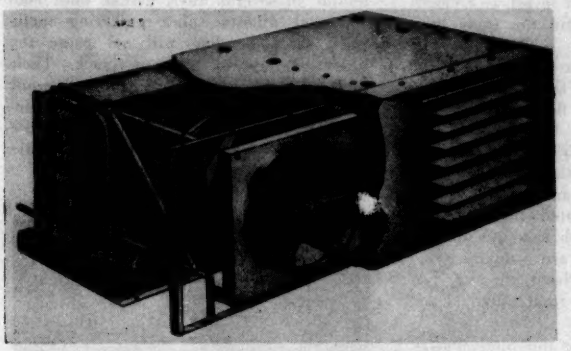
The huge unit is a standard production item at Refrigeration Appliances, and rounds out a line of 10 air cooled condensers ranging in size from one to 45 tons, the company reported.

Step-by-Step photograph sequence shows construction of cold-storage doors using urethane foam insulation

Upper left: Because of the adherence characteristics of urethane foam, a simple wooden frame is sufficient (right). Around the frame is wrapped steel, aluminum, or stainless steel (left). Center: Prepared ingredients are carefully weighed. Note the simplicity of the operation. Nothing more than a pail and a scale is required. Upper Left: A catalyst is added and the solution is mixed with a hand mixer. After the catalyst is added, the operation must move rapidly because foaming-up begins immediately. Lower Left: Liquid is poured through slots at edge of door frames. Urethane foam expands within 10 minutes; is allowed to stand overnight. Then door is sealed and hardware is added. This cluster shows four doors being foamed in the operation.

Freezer Air Units

HEAVY duty air units for blast freezers or holding freezers are now offered by the J. E. Watkins Co. 307 Lake Street, Maywood, Ill. Watkins Bulletin F-1 lists standard sizes from 3 tons to 15 tons with an air range of 6F and a temperature difference of 13 F between entering air and refrigerant. The company makes larger or non-standard units as required.



Heavy Duty Unit for Blast Freezer

A special feature of the Watkins unit is a hot gas defrosting finned coil built-in so that this coil provides additional evaporator surface when not being used for defrosting. The company also offers the coil and fan assemblies separately where required for use in blast tunnel or false ceiling construction.

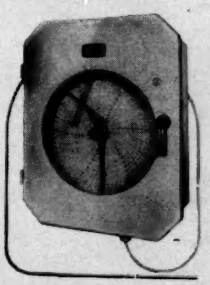
New Dehumidifier at Chicago Show

A NEWLY developed space dryer, Model 105, was unveiled by Dryomatic Corporation at the 13th International Heating & Air Conditioning Exposition in Chicago, February 25 to March 1. Using electrically regenerated drying agents, the machine is capable of maintaining humidities as low as five percent in 35,000

Dryomatic new model 105 dehumidifier shown at International Heating and Air Conditioning Exposition.

cu. ft. of space over a wide range of temperatures. This machine, as well as other industrial models exhibited, is designed for use in processing rooms, storage areas, cheese curing rooms, candy plants, laboratories, plastic molding operations, and other locations where a dry atmosphere is required. In addition to its industrial line, Dryomatic also showed household dehumidifiers of both the refrigeration and adsorption type. Other features of the exhibit included the application of dehumidifying equipment in NIKE guided missile launching sites and other Defense Programs.

Witness for the PROTECTION . . .



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Ball Valves Introduced For Refrigeration Compressors

INVENTION of a gas compressor valve utilizing a ball-check principle was announced early in 1957, by the Ball Valve Company of Kansas City, Mo., and Chanute, Kans. Although the valves are just being introduced commercially, they have been in production for a number of years. They have been manufactured by the Ball Valve firm for horizontal double-acting

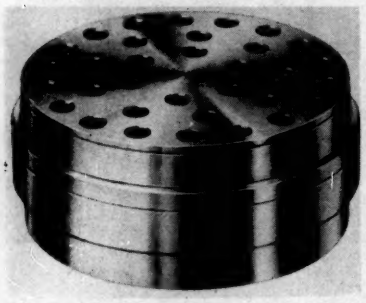


Fig. 1 — Complete assembly of the Ball Valve now marketed for replacement valves in horizontal and VSA compressors.

natural gas compressors, air compressors, carbon dioxide compressors and the old style horizontal double-acting ammonia compressors as well as the more popular vertical single-acting refrigerant compressors. However, the inventor and manufacturer have not publicized the marketing of these valves until recently as it was their intention to time-try them in practical applications.

The Ball valve utilizes three basic principles in its design, which the inventor feels makes it superior to other types of valves now in use in industrial compressors. The three basic advantages are less wind resistance around a ball than a flat surface, a ball will seat itself more perfectly and with less wear, and the multiple ball design provides greater free area of gas flow through the valve.

Advantages Detailed

Multiple ball construction offers less wind resistance because the ball itself is perfectly streamlined and deflects air or gas into ducts in the valve assembly. Absence of angular turns in the flow stream are set to reduce heat to a minimum. According to data supplied by the valve developers, a 90 degree turn is the equivalent of friction or resistance in eight lineal feet of pipe.

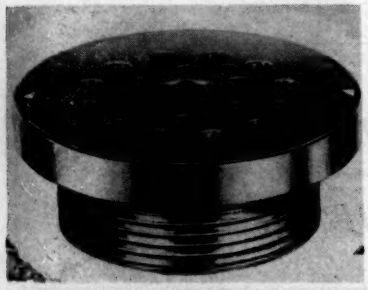


Fig. 2 — Replacement assembly for suction valve in well known make of heavy duty refrigerant compressor.

The second basic principle upon which the valve was developed is that a ball always drops back so that a different part of its surface contacts the seat. According to the inventor, this results in vastly prolonged wear and perfect seating. There is no tendency for the seat to act as a chisel, repeatedly pounding into the same position on the ball.

The third advantage claimed by the valve developers is that this design is from 20 to 100 percent less flow resistant than other valves available. Construction permits air flow completely around the ball.

In addition to practical proof of the ball valves' durability and efficiency, the developers have submitted their product to the Midwest Research Institute for various tests. The tests are said to have borne out the design advantages and verified conclusions drawn from the field applications.

A booklet introducing the revolutionary Ball Valve is available from the Ball Valve Company, Postoffice Box 53, Kansas City 41, Mo. Price lists are also available to those firms which will indicate the type of compressor used in their plants.

New Boiler Tube Expander Control

A NEW air-powered condenser and evaporator tube expander drive and control is described in Bulletin 56-1, recently published by Thomas C. Wilson, Inc., Long Island City, New York. The advantages of precise tube rolling are discussed and the features of the new device, known as Models A and AA Torq Air-Matic are described.

Torq Air-Matic in operation.

According to the manufacturer, it is a completely integrated penumatic tool for rolling and controlling the uniform expansion of ferrous or non-ferrous heat exchanger tubes. No supplementary control equipment is required. It is safe to use in hazardous fire-zone areas encountered in the process industry. It is easy to operate, with push button control. To operate, simply adjust the torque, insert expander, press button and expanding will automatically stop at predetermined tightness.

New Flexible Gasketing

A NEW group of gasketing materials that have more flexibility, ease of application, and increased durability, have been developed by the Industrial Division of the Armstrong Cork Company. The new asbestos fiber materials are unique in several ways. Unlike most conventional asbestos fiber gasketing materials, sharp bending will not cause the new materials to pipe or crack. Their built-in toughness and flexibility permit easy handling and allow for clean die-cutting operations since there are no loose fibers to become detached to contaminate contained fluids or clog orifices.

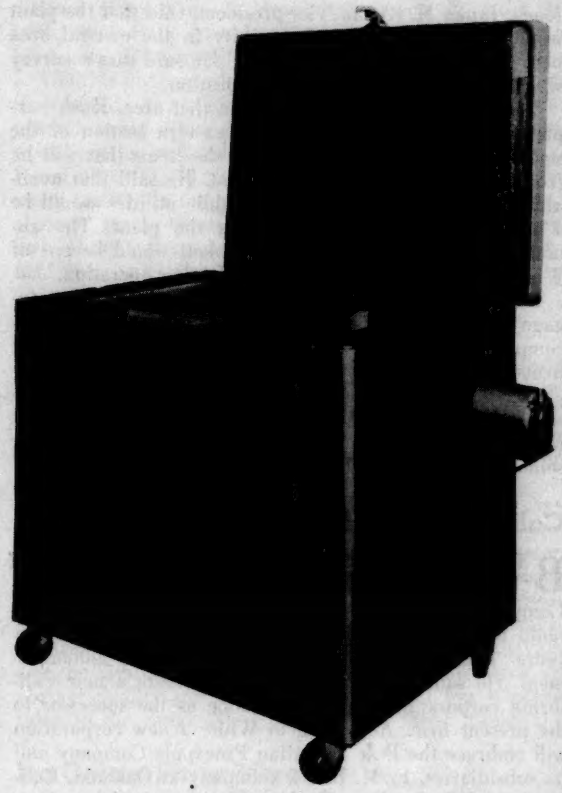
Testing asbestos fiber gasketing material made by Industrial Division of Armstrong Cork Company. As shown, a 1/32-inch sheet of the new "Accopac" asbestos fiber compound will withstand sharp bending around a pencil without piping or cracking.

Unusual compressibility is another prime characteristic of the new Armstrong asbestos compounds. For example, they seal perfectly under considerably lower bolting pressures than those required for hard compressed asbestos sheets. These unique characteristics are the result of the manufacturing process under which the fiber sheet materials are made. In this process, the asbestos fibers are refined to eliminate all lumps and bunches of fibers. The fibers are then coated uniformly with rubber binder by a patented "beater-saturation" process. In this operation, special saturants are added to a water slurry before the composition is formed.

In test installations, the new asbestos gasketing materials show perfect sealing performance with minimum bolt torque loss where flange temperatures are up to 500 F, and internal liquid pressures are up to 500 psi. Data are being developed on these compounds for higher temperatures and internal pressures. The new compounds are available with styrene-type rubber binder, nitrile-type rubber binder, and chloroprene-type rubber binder. All are available as roll goods, sheets, or die-cut parts.

Multi-Environment Test Chamber

A NEW, self-contained, automatically controlled high-low temperature chamber for treatment of metals and various other production materials, as well as for multi-environment testing of materials, components, instruments, etc. has been introduced by Mantec Inc., El Segundo, Calif. Pre-selected temperatures ranging from minus 100 to minus 400 F are automatically produced and maintained within plus or minus 2 F. during continuous operation.

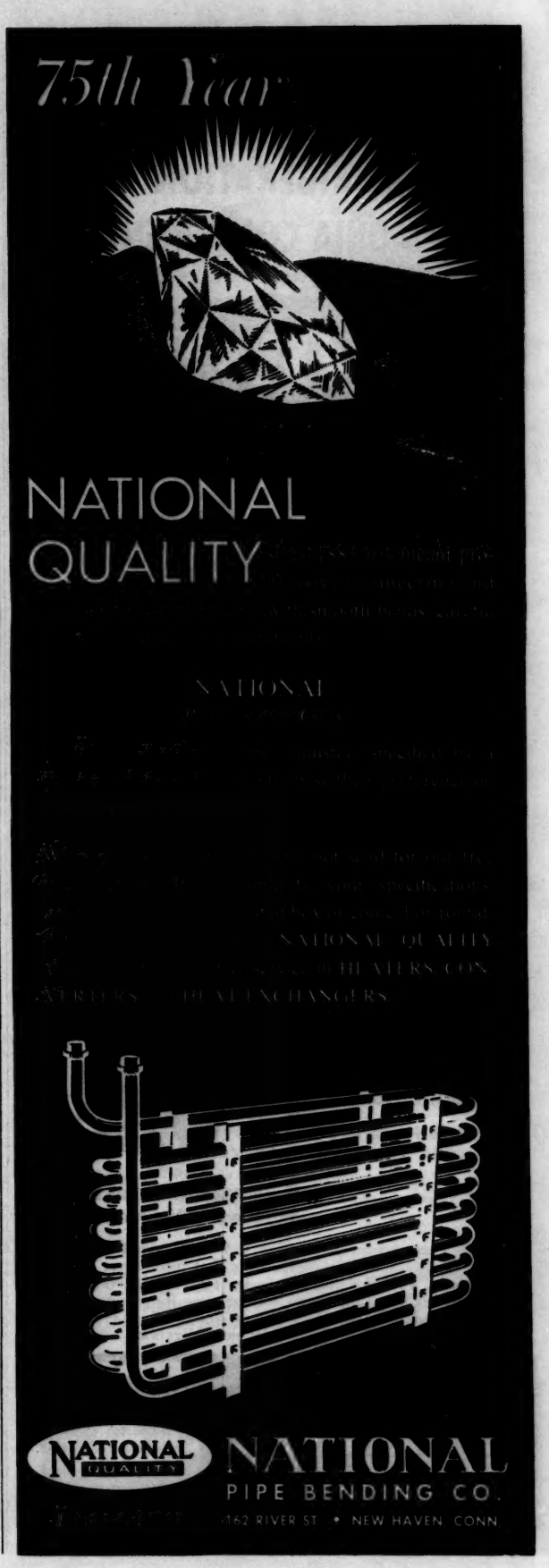


New Multi-environment test chamber, D-104

Constructed entirely of steel, the new Model D-102A has a 12 cu. ft. stainless steel inner chamber, completely sealed to prevent moisture seepage into insulation. The chamber temperature can be dropped to minus 65 F in 40 minutes or raised to 400 F in 30 minutes, starting at room temperature. Low temperatures are generated by dry ice placed in a special compartment. A motor driven fan circulates air over the ice. Refrigerated air then passes through the working volume in a double convection system. During operation temperature is automatically held to plus or minus 2 F of the control point. High temperatures, selected by a 3-wattage switch, are supplied by an electric heating element. Operating with a minimum heat setting, the sensitive thermostat will maintain temperature within plus or minus 2 F of the control point. Standard design includes a triple-pane, sealed observation window and three instrumentation ports.

New Heat Pump Line

A LINE of heat-pump air conditioners to provide year-round heating and cooling of residences and commercial establishments will soon be placed on the market by York-Shipley, Inc., York, Pa. S. H. Shipley, president of the Pennsylvania manufacturer of automatic heating and cooling equipment, reveals that his company has completed the research and development. The design has been proved through many actual installations, and York-Shipley will promote an aggressive sales program to sell these new units. The heat pumps will be incorporated with Shipley's line of air-cooled condensing units for remote installations.



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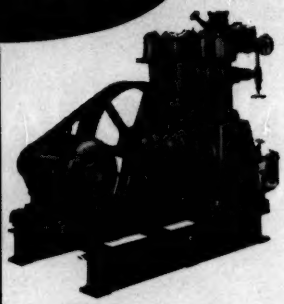

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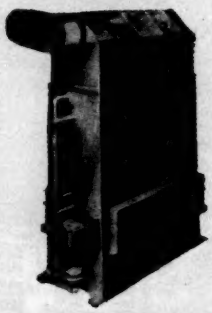

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PRESS BRIEFS

New Wisconsin Frozen Food Plant

THE WISCONSIN Cold Storage Company of Milwaukee plans to start construction this summer of a large plant costing "several million dollars" for the processing and packaging of frozen fruits, vegetables and other foods. James H. Kuehn, vice-president, said that the plant would be located "in a community in the general area between Milwaukee and Madison." He said that a survey was being made to find a suitable location.

The reason for selecting a site in that area, Kuehn explained, is that most of the southeastern section of the state is ideal for growing most of the items that will be frozen and packed in the new plant. He said that availability of railroad facilities and public utilities would be a major consideration in locating the plant. The announcement claimed that the new plant would be one of Wisconsin's major frozen foods packaging operation.

But the company does not intend, Kuehn said, to engage in the frozen food business itself. They expect to complete negotiations with several food manufacturing firms to operate the new plant. Detailed plans for the new plant will not be completed until after a site has been selected. But it will be fully mechanized with the most modern equipment including immersion freezing for some items, principally poultry.

California New Home of Dole Pineapple

BUSINESS reports and publications recently carried an announcement that the Dole Hawaiian Pineapple Company will move its corporate headquarters from Honolulu to San Jose, California, piecemeal in the next few years. President Henry A. White made the announcement. He said the company plans to create a new California corporation with a new name as the successor to the present firm. According to White a new corporation will embrace the Dole Hawaiian Pineapple Company and its subsidiaries, F. M. Ball & Company at Oakland, California and Paulus Bros. Packing Company at Salem, Oregon in one entirely new company.

Canadian Warehouse Expands

WITHIN a year of the completion of its frozen food warehouse on the Queen Elizabeth Way at Van Wagner's Beach, Hamilton, Ontario, Langs Foods Limited has awarded contracts for an expansion that will more than double its capacity. J. R. Langs, manager, said expansion is imperative to meet the frozen food distribution requirements in the growing residential-industrial belt extending westward to London and east to Toronto and Montreal. This is the firm's fourth expansion since the Bay Street storage plant was opened in 1940.

Research Laboratories Opens Western Branch

FOOD Research Laboratories, Inc., announced in February, the establishment of a Western Branch in Los Angeles. Dr. B. H. Ershoff, prominent nutritionist and biochemist who for many years has been associated with the University of Southern California will be in charge. The office will be located at 9331 Venice Boulevard, Culver City. A laboratory will be maintained for nutritional, toxicological and pharmacological investigations.

Tax Relief for Small Business

SINCE early January, a group of businessmen and representatives of trade associations have been holding weekly meetings to examine and study the possibilities of federal tax relief for small business. Tax adjustments that would provide incentive for additional investment in depreciable assets are needed greatly by small and medium size business, it is stated. Moreover, a deduction from taxable income equal to a percentage of additional investments in depreciable assets or stock in trade during the taxable year, if granted, would be a boon to small business.

Additionally, consideration is being given to a proposal that would: (a) allow individuals to purchase non-interest bearing estate tax anticipation certificates, which would not be included in the taxable estate up to a maximum of $100,000 and (b) permit the payment of the estate tax within ten years after death. The present federal estate tax is especially burdensome on small businessmen whose assets consist largely of investments in closely-held business concerns.

Refrigeration for Sterilized Foods

A NEW and highly important project, conducted by Dr. Olin T. Ball and Dr. Walter Maclinn, Food Technology Department, Rutgers University, is now being sponsored by the Refrigeration Research Foundation. The title is "Use of Refrigeration to Retain Quality During Storage of Sterilized Foods."

Of course, sterilized foods means canned foods. New high-temperature short time processes are capable of sterilizing foods with retention of important quality factors such as color, flavor, texture, vitamin content, to a highly significant degree in comparison with other processes. Such foods are subject to certain physical and chemical changes not associated with microorganisms or enzymes and the aim of the project is to determine how much important quality can be retained by use of low temperatures in the range above freezing. — TRRF Bulletin.

Ice Cream Firms Merge

CONSUMERS Ice Cream Co., largest independent ice cream producer in the Port Arthur area, has merged with Oak Farms Dairies of Dallas, Texas' largest independent dairy. The merger was announced jointly by Dan Johnson, president of the Port Arthur firm, and M. M. Palmer, vice-president of Oak Farms.

The merger is Oak Farms' second major expansion move within the past two months. The company recently completed a merger with Anderson Creamery Co. of Temple, major Central Texas ice cream manufacturer. J. S. Searcy, manager of the Consumers company for the past nine years, will become Port Arthur sales manager for Oak Farms. The Port Arthur firm, established in 1916, serves customers in the Port Arthur, Orange, Beaumont and other cities in Jefferson County.

Science Studies Antarctic Frozen Food

CANNED goods, preserved for more than forty years in the natural deep freeze of Antartica will be used in a government study of radioactivity in foods, it was announced in Washington. The foods will be obtained from a camp site occupied by the British Antartic expedition in 1908-09 under Sir Ernest Shackelton, and a camp established by Capt. Robert Falcon Scott of the British Navy during his last Antartic expedition from 1910 to 1912. Capt. Scott perished on the expedition.

FOR HEAVY LOADS OF SHORT DURATION

Many of America's finest churches depend on DOLE *Ice-Cels* to provide the ultimate in air conditioned comfort for their congregation. The compact design of the *Ice-Cel* Units permits easy installation in the least amount of space. Initial investment is small and operating costs are low. Applicable for churches, offices, stores, theaters, auditoriums, cafeterias, mortuaries.

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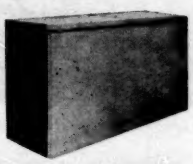

DOLE REFRIGERATING COMPANY
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103 PARK AVENUE, NEW YORK 17, N. Y.
In Canada: Dole Refrigerating Products Limited
44 Elgin Street, Brantford, Ontario

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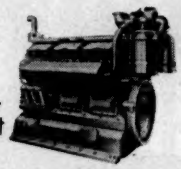
Maximum Refrigeration Efficiency DOLE THE *Cel* LINE

Ice-Cel UNITS
THE BEST IN AIR CONDITIONING

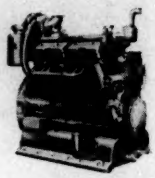
MODERN HEAVY-DUTY CAT* DIESELS FOR REFRIGERATION

D397
with Turbocharger
650 HP†



Also a Roots blown, naturally aspirated or spark-ignition engine; electric set or torque converter power unit. Air, electric or gasoline starting.

D375
with Turbocharger
430 HP†

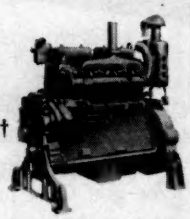


Also a Roots blown, naturally aspirated or spark-ignition engine; electric set or torque converter power unit. Air, electric or gasoline starting.

D342
Naturally Aspirated
210 HP†

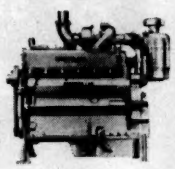
Also available as an electric set. Choice of air, electric or gasoline starting system.

D339
Naturally Aspirated
140 HP†



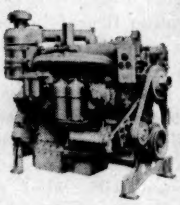
Choice of air, electric or gasoline starting system.

D337
with Turbocharger
310 HP†



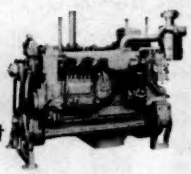
Also available as an electric set or torque converter power unit. Choice of air, electric or gasoline starting system.

D326
Naturally Aspirated
200 HP†



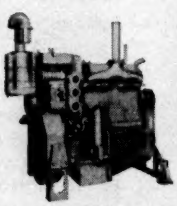
Also available as an electric set or torque converter power unit. Choice of air, electric or gasoline starting system.

D318
Naturally Aspirated
137 HP†



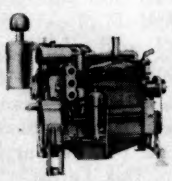
Also available as an electric set or torque converter power unit. Choice of air, electric or gasoline starting system.

D315
Naturally Aspirated
91 HP†



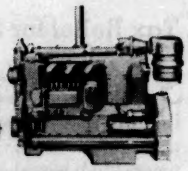
Also available as an electric set or torque converter power unit. Choice of air, electric or gasoline starting system.

D311
Naturally Aspirated
65 HP†



Also available as an electric set. Choice of air, electric or gasoline starting system.

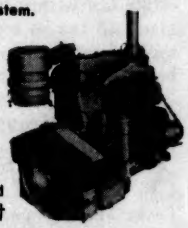
NEW D318
(Series G)
Turbocharged
175 HP†

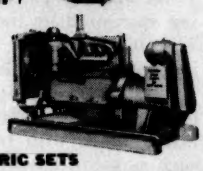


SMALLER, LIGHTER AND LOWER PRICED!

Keeping in line with Caterpillar's continued diesel leadership are these new Series G engines. They are designed for use in installations where space is at a premium. Both are small, light and low-priced; yet they deliver dependable power with the renowned Caterpillar durability. Both are available naturally aspirated (shown here) or turbocharged. Choice of air or electric starting system.

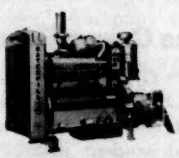
NEW D315
(Series G)
Turbocharged
115 HP†





ELECTRIC SETS

Dependable electric power, featuring the new Cat Generator, available in standard voltages, 60-cycle, in the following KW sizes: 30, 40, 60, 100, 150, 165, 200, 225, 250, 315, 350. Also available as 50-cycle and DC units.



TORQUE CONVERTER POWER UNITS

Many different arrangements are available for each of six Cat Engines. Wide choice of power units and wide choice of output shafts.

†maximum output capacity

In its quarter century of diesel leadership, Caterpillar research has been responsible for advance after advance in the efficiency of these engines. The units you see here incorporate the latest diesel developments – a modern heavy-duty line that offers you many packages to meet your requirements for work power or standby power. Whatever your original or replacement needs, you'll find exactly the unit you want in this line-up, with engines available up to 650 HP (maximum output capacity) and electric sets up to 350 KW (continuous duty). Leading equipment manufacturers can supply them in the machines they build. For complete information about them, see your Caterpillar Dealer.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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In the Spotlight

COOPERATIVES in Shenandoah Valley, Virginia, provide utility refrigeration services to transportation companies, buyers and others, as well as their own farmer-owner members. A typical example is described in ". . . Diversified Services For Big Cooperatives . . .", page 13. This community refrigerating plant produces ice for railroad car and truck icing, provides freezing capacity for poultry plant blast tunnels, refrigeration for low temperature storage, and temperature conditioning for apple crops as well. Although the plant has grown in many steps over 40 years, application of good refrigerating practice has kept it as modern as the departments that it serves.

ANNUAL MEETING of the American Society of Heating and Air-Conditioning Engineers, held in Chicago featured topics of the day on engineering problems of the industry. A symposium on dehumidification, the limitations of refrigeration as a dehumidifying agent, and uses of liquid sorbents as dehumidifiers were among the high points. For report of the meeting, see page 18.

SEMI-AUTOMATIC ICE making is described by H. L. Dithmer, Polar Ice & Fuel Co. Indianapolis, in article on page 19. This was a paper at the National Ice Convention. In these semi-automatic ice plants, one man working one shift with the help of automatic controls does all the operating. The automatic controls make it possible to leave the plant unattended over night. With experience, the process runs more smoothly. For instance, last year, it showed a considerable increase in production over the previous year.

AN IMPORTANT discussion at the National Frozen Food Convention covered low temperature operations, conducted by a special panel session, the panelists being leading industry members, experts on insulation and product handling. Increased plant efficiency was stressed as the best means of competing with non-frozen foods. Report of this discussion is given in article on page 21.

FUEL SAVINGS of considerable amounts are possible with the use of heat pumps, according to operation figures on the installation in the 12-story Equitable Savings & Loan Building in Portland, Oregon. From data obtained from cost studies for a year, comparative costs were obtained and included in this article, starting on page 22.

LAST MONTH the NAPRE Educational Committee, in its preventive maintenance series, showed how good annual inspection and overhaul is conducted in one multi-storied refrigerated warehouse plant. Featured in the account was a unique method of a horizontal compressor. This month a multi-cylinder compressor in a single-story plant is featured with emphasis on inspection procedures. Management in both plants lives closely with engineering, which explains the effective and efficient maintenance practices followed. See page 25.

HEAT PUMPS have a definite place in the all electric home of the future, according to C. W. Barry, Philadelphia Electric Co. "An All-Electric Home," he said, "cannot be attained without electricity providing comfort through heating and cooling of the home."

PRACTICAL ANSWERS are given to not only questions about refrigeration topics, but also concerning allied subjects to the industrial refrigeration field. For example, this month Prof. H. P. Hayes describes the basic construction and operating principle of an "electric eye." Repair of ice cans with fibrous glass and resin is also mentioned. A valuable reference on water treatment is given in reply to a third question. The reader who misses this section, starting on page 34 misses a bonus in reader benefits.

BEST YEAR in history. That's what 14 economists predicted at a National Industrial Conference Board Economic Forum for business in 1957. Output is expected to rise in the first half of the year, then taper off or level off.

FOOD COMPANY merger trend almost certainly will be accelerated this year. Larger firms will seek further product diversification to broaden their bases. And many small companies will find it difficult to finance adequate research development, modernization, and promotion.

NEW ZEALAND, which recently started shipments of frozen vegetables to Australia in insulated boxes, deck loaded, aboard ships, is now extending the service to the United Kingdom. Shipment of 270 tons of frozen peas was made recently and several parcels of frozen sweet corn will be shipped soon.

REFRIGERATED Egg vendors may become quite common in the next few years according to D. D. Bragg, specialist at Virginia Polytechnic Institute. The vendors would be part of a trend toward quality control of eggs which among other things would provide refrigeration from farm to frying pan. The vendors would be placed outside stores or at roadside stands for 24-hour convenience of buyers.

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CAPACITY

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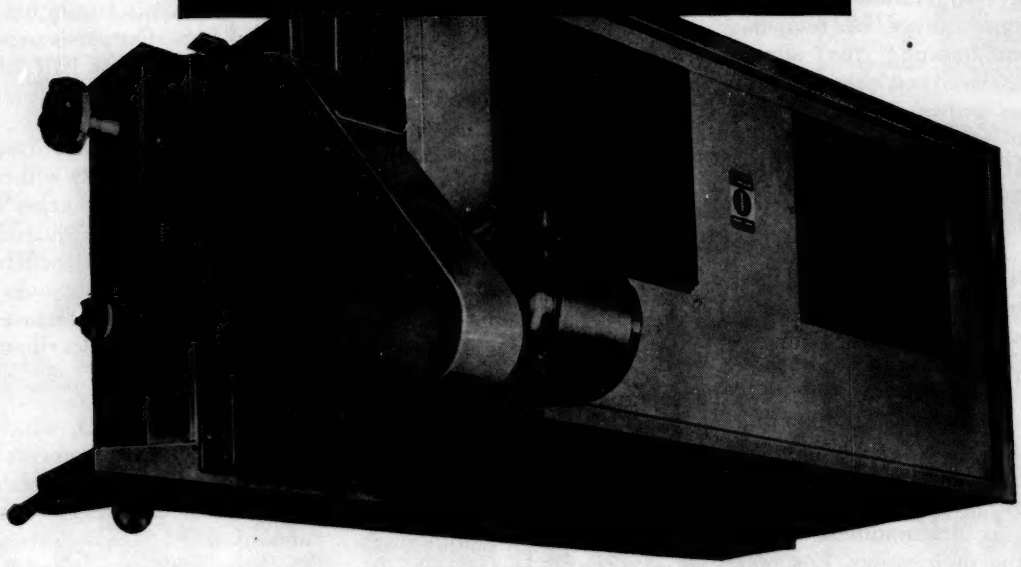

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NOW...no job is too large for the KRAMER THERMOBANK

The only completely automatic system for freezing temperatures offering these extra large capacities. THERMOBANK requires no manual attention whatsoever.

Ceiling mounted, THERMOBANK takes no precious floor space. You can store products directly under the unit.

Can be used as an independent system or with an existing large system without affecting the operation of other evaporators.

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Refrigeration Provides Diversified Services For Big Cooperatives In Shenandoah Valley

TERRY MITCHELL, M.E.
Frick Company

Community Refrigeration Center — This cold storage facility and its refrigerating plant serve the needs of 9000 farmer-member producers in the Shenandoah Valley.

SHENANDOAH Valley, Virginia, is not only famous in song for its beauty, and in history for its action scenes, but today it has acquired added recognition for its achievements in fruit growing, poultry producing and livestock raising. Cooperatives have played a great part in the expansion and successful growth of the food industry in the Valley. Refrigeration, of course, has been a chief utility applied successfully by the Cooperatives in strategic marketing of Shenandoah apples, poultry and meat products.

The famed Shenandoah Valley of Virginia traces its history back to 1716, when Governor Spotswood and his party, called the Knights of the Golden Horseshoe, climbed to the top of the Blue Ridge and descended to the river. Agreements made with the Indians permitted the Great Valley to become the frontier during the time of George Washington. Colonel Washington collected troops and supplies at Winchester and nearby points for the campaigns of the French and Indian Wars (1754-63).

A century later the Valley rang with the names of such heroes as Stonewall Jackson, Philip Sheridan and Robert E. Lee. In recent times, men like the late Admiral Byrd and his brother, Senator Harry F. Byrd, have brought renewed fame to this section of Virginia. Senator Byrd is now the largest grower of apples in the world, and Winchester is the greatest center of the apple industry. The Apple Blossom Festival held there every year attracts many thousands of visitors.

Marketing Cooperatives

The remarkable growth of the fruit industry has been paralleled, further up the Valley, by poultry and livestock raising. Between the little towns of Broadway and Timberville, in Rockingham County, there has sprung up an impressive center for the processing and storing of farm products. Here are grouped together a number of highly successful cooperatives.

These include the 1½ million-dollar Shen-Valley Meat Packers, the Rockingham Coop. Farm Bureau, several hatcheries, and the Rockingham Poultry Marketing Coop, Inc. National Fruit Products also has a big warehouse and cannery in the same area.

Mutual Cold Storage was the first to be established in the area, and in a sense made the others possible. This was started in 1916 as a very small ice and cold storage plant, which secured power from a waterwheel driven by a tributary of the Shenandoah River.[1] Twenty-two years later (1938) the Mutual plant included a cold storage building six stories high, a locker room with 1200 compartments, and a quick-freezing tunnel.

Refrigeration Center

With the opening of the new fruit storage, the handling of apples became the most important part of the business. In that same year the property was acquired by the Mutual Cold Storage Cooperative and its facilities were further expanded. Within 10 more years the business was referred to as a noteworthy example of a community refrigeration center (pictured above).

The Rockingham Poultry Marketing Cooperative (Fig. 1) was established in 1940, and by 1948 was handling 50,000 pounds of chickens or turkeys a day. A subway (Fig. 2), 128 feet long, was built under

[1]The enlarged plant still stands on a bluff about 30 feet above the level of the stream, which at long intervals has been known to flood the site. For this reason, the row of shell vessels serving as ammonia liquid receivers today are anchored by bolts to the foundations, so they cannot float.

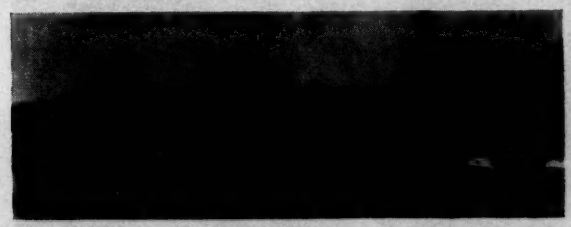


Fig. 1 (above) — Poultry processing plant erected in 1940 by the Rockingham Poultry Marketing Cooperative is connected to the freezer and storage plant by conveyor equipped subway under the roadway area shown here. Plant has a lower floor, reached by the ramp shown at right.

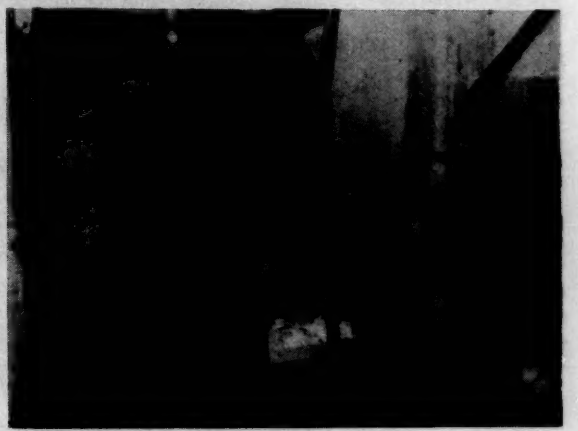


Fig. 2 (right) — Conveyor carries poultry through 128-ft. tunnel to quick-freezing and storage building.

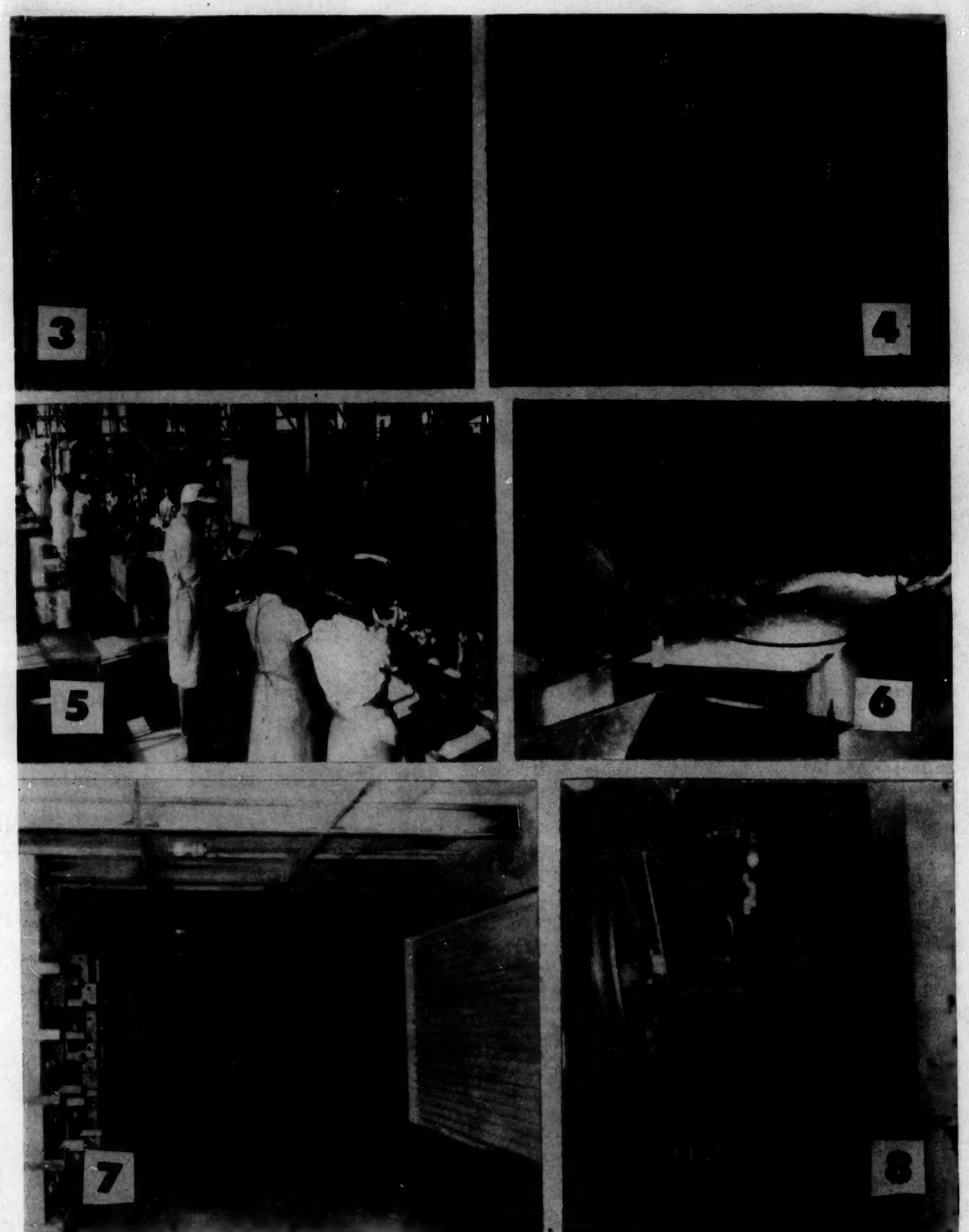


Fig. 3 — Ice storage room, holding 2000 tons, is equipped with tiering machine and conveyors. Fig. 4 — Boxes of apples in the fruit storage room which holds over 300,000 bushels. Fig. 5 — There are three poultry processing lines at Rockingham, able to handle 4500 chickens an hour. Fig. 6 — Poultry is "Acronized" while being chilled with ice water, agitated by compressed air. Fig. 7 — New air-blast Frick-freezer has spiral-finned cooling coils arranged in tiers or banks at the right. Fig. 8 — Proppeller-type fans circulate 110,000 cfm of air, but use only 24 total hp.

the parking area to connect the Poultry Cooperative with the quick-freezing tunnel in the basement of the Mutual Cold Storage Cooperative. Shortly thereafter additional freezer capacity was required, and a new tunnel was constructed on the third floor, with a quick-freezing capacity of four tons an hour. Temperatures in this freezer reached a low of minus 45 F.

Freezer storages were constructed to hold 1½-million pounds of frozen food. The total capacity of the fruit storages was raised to 375 thousand bushels. When apples are not being handled, the fruit storages are used for other purposes. The Government has stored as many as 280 carloads of potatoes here, and millions of pounds of peanuts have been held at 32 degrees for months, to accommodate the canners in Southeastern Virginia.

Operations Merged

In 1954 Rockingham Poultry Marketing Cooperative bought out the Mutual Cold Storage Cooperative. The entire operation is now owned by eight or nine thousand producing farmer-members of the Rockingham Poultry Marketing Cooperative, Inc. Branches are maintained at Stuarts Draft, Winchester, Alma and Richmond, Virginia and at Moorfield, West Virginia. Officers are: T. W. Heitz, General Manager and Treasurer; Victor Pringle, Assistant General Manager; Charles O. Weaver, Manager of the Cold Storage Division.

By 1938 the 1916 vintage ice-making plant had been superseded by a 50-ton ice tank using whole-row lift and a brine race for rapid freezing. This tank still makes wonderfully clear ice with the pendulum air system. For summer needs 2000 tons of ice can be held in the adjoining storage room (see Fig. 3), into and out of which the blocks are carried by conveyors. Hundreds of railway cars have been iced each year for the Fruit Growers Express, in addition to numerous trailer trucks. Ice is also furnished to the new poultry plant built across a paved court in front of the fruit storage. See an interior view of apple storage in Fig. 4.

Modern Poultry Processing

Production in the poultry plant has increased until 4,500 chickens can be handled per hour, using three

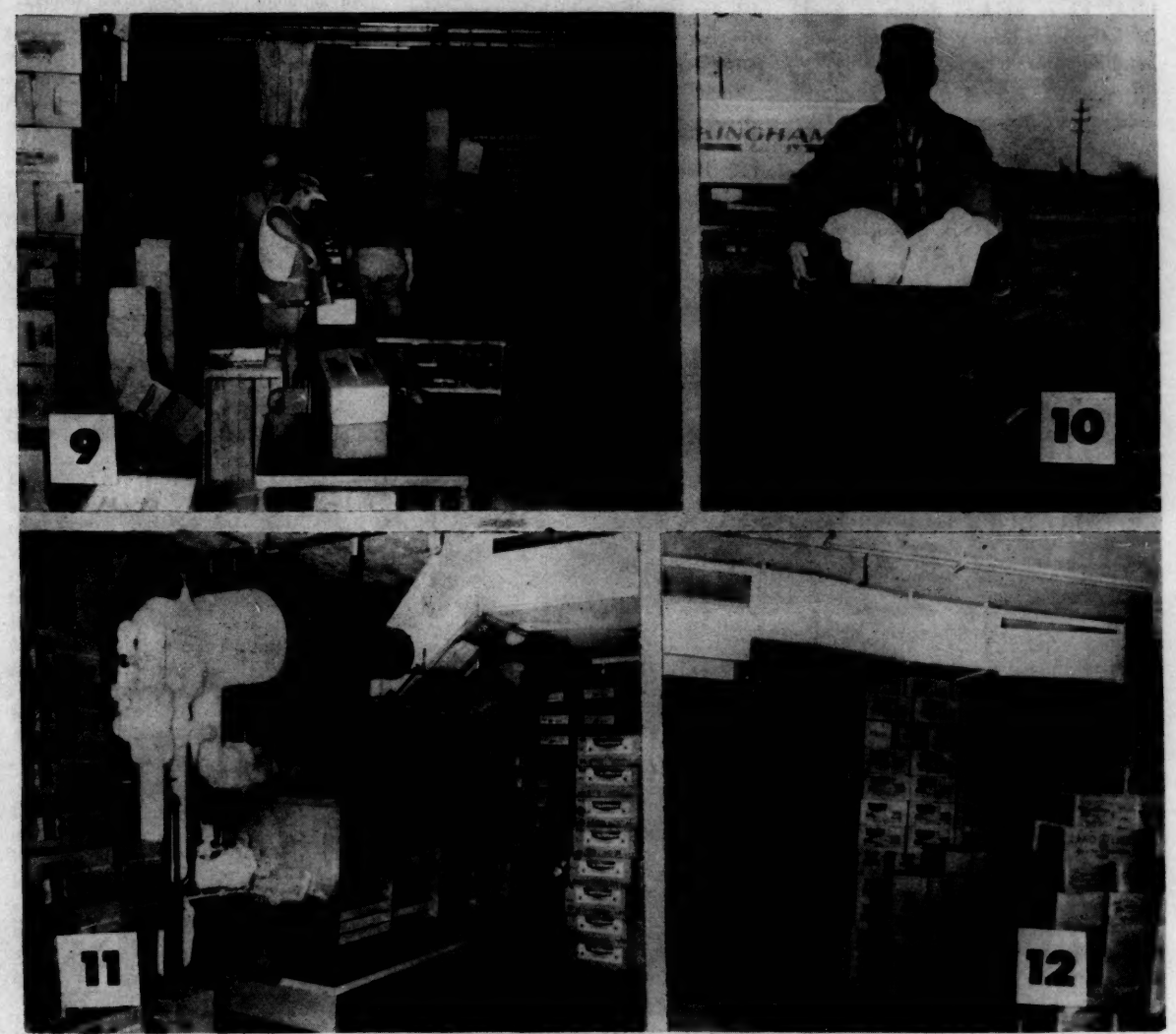


Fig. 9 — Boxing packages of poultry just received from the quick-freezer. Fig. 10 — Turkeys frozen in carton with open sides (and reinforced corners) speeds freezing. Fig. 11 — Frick air cooling unit with automatic hot-gas defrosting, in typical freezer storage. Fig. 12 — Frozen poultry in freezer storage room.

conveyor lines. These broilers weigh an average of 2-¼ pounds each. For a view inside the plant, see Fig. 5.

Now that turkeys are available on a year-around basis, it is not unusual for several conveyor lines to be devoted to them. If all three process lines are handling Beltsville turkeys, the average weight of which is 7½ pounds, 1000 can be dressed per hour. Bronze turkey hens, weight 12 pounds, can be handled at the rate of 650 per hour, and 20-pound bronze toms at the rate of 400 per hour. Total capacity is over 23,000 pounds per hour. All turkeys are quick-frozen and so are about 25 percent of the chickens.

The long wing feathers of the turkeys are cut off by a circular saw, as the first step in the process, this being done without injury to the birds. Every modern device is used in the process lines to insure efficient handling and to preserve quality.

Acronizing Process Used

Originally poultry after being dressed had the body heat removed in concrete vats supplied with crushed ice. It was then held temporarily in a room kept at 36 F by refrigeration piped over from the engine room of the Mutual plant. The concrete vats in which the birds were chilled with crushed ice are now supplemented with movable tanks (see Fig. 6). Poultry is Acronized[2] while being cooled in the ice water. This treatment uses the wide spectrum antibiotic-aureomycin for lengthening the shelf life of fresh poultry products. The birds are later protected with Cryovac latex bags, applied under a vacuum.

Modern Quick Freeze Added

In 1956, a new quick-freezing tunnel was installed, which increases the freezing capacity to 140,000 pounds per 12 hours. The new tunnel has spiral-finned coils (Fig 7), propeller-type fans (made by Hartzell), mounted along one side (Fig. 8). These 16 fans use a total of only 24 motor horsepower, deliver 110,800 cfm of air, and are readily accessible.

The finned coils appear in the photograph just beyond the fan blades. The air velocity is such that the coils are kept free of excessive frost. It is only necessary to defrost the tunnel every two or three weeks. The new tunnel is located on the main floor of the cold storage building. The tunnel itself was built inside of a room held at zero F.

Open-Side Carton For Freezing

Poultry is packed in attractive cartons. The cartons are received flat,

[2]An antibiotic food preservation adjunct; an American Cyanamid Co. development; see INDUSTRIAL REFRIGERATION Jan., June, Sept., 1956.

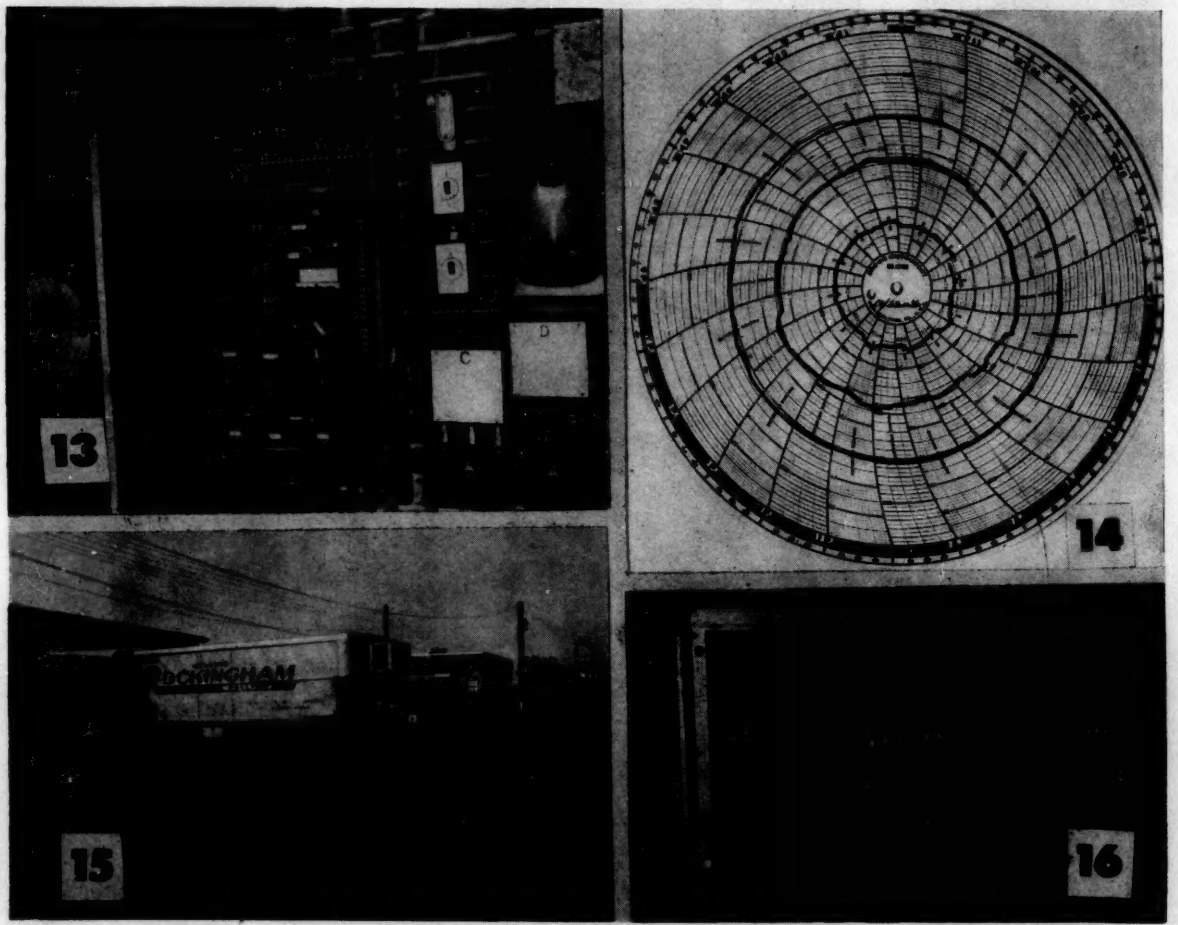


Fig. 13 — Automatic program-clock controls which defrost four air cooling units in freezer storages. Fig. 14 — Recording thermometer chart showing uniform handling of quick-freezer and high-temperature suction loads, also condensing pressure, in Autumn. Fig. 15 — A fleet of Thermo-King refrigerated trucks distributes the product over many states. Fig. 16 — Loading refrigerated trucks with frozen poultry.

and are formed into boxes and stapled at the front end of the packaging line (see Fig. 9). To speed the freezing of the turkeys, they are placed in a new type of carton with an open side, as illustrated in Fig. 10; the cut-away material is folded back to form a rigid triangular support at each corner of the box.

The four new air-cooling units installed in the freezer storage rooms (Figs. 11 and 12) have spiral-finned coils, arranged for automatic defrosting with hot ammonia gas. A central panel (Fig. 13) has mounted on it all the necessary controls for defrosting the four air units. The actual defrosting is done in a series of steps; the refrigerant feed is first cut off by the closing of electric control valves, and the ammonia in the coil is pumped out for about 20 minutes.

Hot gas is next introduced under sufficient pressure to blow into the accumulator any remaining liquid ammonia, and to defrost the coil. After a few minutes, the frost is melted off and drained away. The hot gas is then shut off, and the necessary steps are taken to put the unit back into service before the temperature in the room suffers any appreciable loss. Recording thermometers show that remarkably uniform room temperatures are maintained.

Plant Design & Operation

To secure uniform suction pressures, while holding different temperatures on widely varying loads, the plant has several of its 13 compressors under automatic control (see Fig. 14). Three distinct suction pressures are carried, for power economy, and as much as possible of the work is done on the "booster" or two-stage principle. The lowest suction is brought from the quick-freezing tunnels; the second from the freezer-storage rooms; and a third from the ice-making system and fruit storage rooms (Fig. 16). This high-suction line includes the gas discharged from the booster machines.

Three boosters carry the quick-freezing load. An 11½ × 8 inch and a 13¼ × 9 inch, both with hand starters, are equipped with low-pressure cutouts set at 16 inches of vacuum. A new 15 × 10 inch booster has automatic controls which start it at nine inches of vacuum and take it off the line at 13 inches.

The intermediate suction from the freezer storages is carried by an 11½ × 8 inch booster under full-automatic control, set to start at zero pounds gauge and to stop at five inches of vacuum. (Boosters are pictured on the cover).

The high-pressure suction is divided among nine machines. There are two 10 × 10's running at 360 rpm, and two others of the same size at 300. A 9 × 9 inch and a 6 × 6 inch each run at 400 rpm. These six machines are manually started. An 8 × 8 inch running 400 rpm goes on at 20 pounds suction and off at 17, automatically. Another 8 × 8 inch running at 300 starts at 17 and stops at 15 pounds, while an 11 × 10 inch operating at 360 rpm cuts in at 15 and off at 13. This arrangement assures maximum efficiency without increasing labor costs. The 11 × 10 inch compressor is connected to all three suction lines, and is equipped with cylinder-wall thermostats and an oil pressure safety switch, among other controls.

Standby Diesel Plant

All of these machines are the two-cylinder type, and all except one are driven by electric motors. Most of these motors are of Ideal manufacture. One 10 × 10 inch compressor is direct-connected to a Fairbanks-Morse Diesel engine of 150 horsepower, which also drives a 96 k.w. alternator. This generator will take care of the auxiliaries throughout the plant if the main source of electric current fails temporarily. The engine has been in service nearly 20 years.

The total refrigerating load, in round numbers, is 600 tons. Six vertical shell-and-tube condensers, four of 38 in. dia. and two of 32 in. dia., 14 feet high, keep the head pressure between 130 and 160 pounds, according to the season. The pumps which feed the river water to the condensers were furnished by Fairbanks-Morse, and have a total capacity of 3500 gallons per minute.

Mechanical Truck Units

The finished product is shipped in more than a dozen large trailer trucks (Figs. 15 and 16), assisted by several smaller vehicles; all of these refrigerated with Thermo-King units. These trucks carry Rockingham products over many states, and to foreign countries. The colorful rooster called Colonel Rockingham appears above the slogan reading, "Better Dressed than the Rest".

In addition to the dressed poultry, special dog foods and mink foods are prepared. Some of the dog food is packed under private label, while the mink food is marketed under the name of Rockingham. Approximately 30 percent of the live weight of poultry is lost when it is dressed; the animal foods take up some of this loss. These special foods are carefully boiled and made wholesome enough for human consumption before being mixed with meal and other ingredients to form a complete food. The mink food, particularly, is very high in protein.

Sidelights

The Mutual plant for years even manufactured the barrels in which the apples and poultry was shipped. Fruit is now packed in boxes.

Employees on poultry process lines get 10-minute breaks every 2½ hours. Lines generally operate 5½ days per week. Some 500 people are employed.

Mutual Cooperative erected a modern office building in 1948. One of its features — air conditioning, of course.

Continued Increase In Refrigerated Storage

PUBLIC refrigerated warehouses will continue to gain in importance this year, predicts William Dalton, executive vice-president of the National Association of Refrigerated Warehouses, Inc.

Storage space in such warehouses is now more than four times greater than that of 1939 and almost 70 percent larger than in 1945, he said. These structures can handle 7,250,000,000 pounds of perishable food at one time. They contain a collective storage capacity of 500,000,000 cubic feet.

Although New York State's overall storage capacity has been relatively stable in the last ten years, it has continued to be the largest in the country—58,000,000 cubic feet. California, the next leading state, had 49,000,000, followed by Illinois with 46,000,000.

About 250 different kinds of products are generally held in cold storage, including fresh and frozen fruits, juice concentrates, vegetables, meat, fish, poultry, dairy products, nuts, dried fruits and candy. Also stored are such items as florists' and nursery stocks, herbs, batteries, plastics and blood derivatives.

The warehouses have a leveling effect on food prices, preventing disastrously low prices to farmers during the harvest season and high prices to consumers in other seasons. Storage prices, however, are an infinitesimal part of the ultimate price paid by the consumer. Dr. Dalton points out that to store a dozen eggs, or a package of frozen fish costs only a fraction of a cent a month.

Heating and Air Conditioning Engineers 63rd Annual Meeting

CHICAGO was the scene of the 63rd Annual Meeting of the American Society of Heating and Air-Conditioning Engineers held February 25 to 28 at the Conrad Hilton Hotel. In addition to some technical advisory committee meetings on topics of current importance to the heating, ventilating and air conditioning industry, the Society scheduled six sessions of a technical nature which presented speakers on topics of the day or symposiums on engineering problems. One symposium which dealt with refrigeration applications that could be described as of an industrial nature, was the symposium on dehumidification.

Dehumidification Session

The Symposium on Dehumidification was moderated by John Everetts, Jr., Philadelphia, Pa. Dehumidification by Refrigeration was presented by W. E. Ellis, president, Ellis and Watts Products, Inc., Cincinnati, Ohio. Dehumidification by Solid Adsorbents was discussed by W. L. Ross, manager, Development Laboratory, National-U.S. Radiator Corp., Johnstown, Pa. Dehumidification by Liquid Sorbents was discussed by E. W. Gifford, owner, Ed. Gifford & Co., Milwaukee Wis. Economics of Dehumidified Storage was presented by G. W. Higgs, Jr., assistant manager, Supply, Marine Corps, and Research Facilities Branch, Construction Division, Bureau of Yards and Docks, Navy Department, Washington D.C. Typical Dehumidification Problems and Their Solution was discussed by E. R. Queer, director and professor of engineering research, The Pennsylvania State University, University Park, Pa.

In the presentation of Dehumidification by Refrigeration, Ellis presented the uses to which a refrigerating plant might be put for the purpose of dehumidifying, discussed the components of the system, advantages and disadvantages. He was careful to point out the limitations inherent in the use of refrigerating systems for dehumidifying. By means of slides he illustrated the limitations on psychrometric charts and further illustrated basic designs for a dehumidifying system employing refrigeration. For greatest utility he recommended a combination of refrigeration with an adsorption element. His own recommendation was that the desiccant be located in the system after the refrigerating evaporative surface.

Ross in his presentation on solid adsorbents dwelt briefly on the capacity of certain solids. One example given related how a teaspoon of silica gel has the equivalent surface of a football field. By means of slides, this speaker presented schematics of typical dual bed adsorption type dehumidifying machines and drew comparisons between certain common type solids used for this purpose. The operating curves which he showed on a chart outlined the characteristics of these materials. One slide presented a total of 20 variables involved in the design and operation of this type of dehumidification system.

Panelist Gifford presented the uses of liquid sorbents (hygroscopic liquids) as dehumidifying agents. He mentioned briefly the characteristics of lithium chloride, lithium bromide and calcium chloride as the more commonly used sorbents. He then tied his discussion down to comparisons of adsorbent qualities of certain mixtures of lithium chloride and triethylene glycol. His slide presentation depicted a typical system, some equilibrium curves comparing a 44 percent solution of lithium chloride with those of a 95 percent solution of triethylene glycol, a typical problem, and cited the advantages of the sorbent systems.

The speaker indicated that corrosion from these materials was no problem today with the number of inhibitors that are available. One of the psychrometric chart examples which he presented showed three so-called ranges over which adsorbent material would be used. He designated one range as refrigeration, another as air conditioning and a third as medium temperature. Examples were given in each case, and he pointed out that in refrigeration design, engineers deliberately forget the dehumidifying aspects of these hygroscopic liquids and use them only for ice-free evaporative surface.

Cost Statistics Given

In his presentation on economics of dehumidifying storages, panel member Higgs drew on figures and experiences of the Navy Department. He indicated the ideal relative humidity conditions attainable for marine preservation and storage, the large warehouses shoreside, and for medical stores. Among the costs related, based on an average of Naval and Marine Corps warehouses of comparable size, he quoted the cost of 40 cents per square foot of floor space initial cost, and operating figures ranging from two to five cents per square foot per year. His figures indicated the demand of one kilowatt-hour per pound of water removal. One chart of reference used indicated a cost of $4800.00 for operating a dehumidifying system in a 120,000 square foot warehouse. His slide presentations were a series on the comparative costs of dehumidifying vs. non-dehumidifying storages, involving in one case a $12 million dollar stock of spare parts.

Dehumidification Problems

In presenting typical dehumidification problems and their solution, Dr. E. R. Queer defined again, as had panelist Ellis, the designation of static and dynamic methods of dehumidification. According to Queer the dynamic method is much preferred as it has proven more economical and can be applied on a large scale. The problems he presented dealt with long term preservation or storage. He used an example of surface water removal by quoting calculations and experiences of the USS Brooklyn when it was placed in the mothballs.

Queer described briefly how to vapor seal exteriors of storages and the reasons therefor. He described air locks as not being economically practicable in general and spent some time describing the present practice of utilizing caves for storages. He pointed out such caves should be free of running water, not subject to flooding and should be in an area located close to mass transportation and where utilities are relatively reasonable. He used the figure of 42 percent relative humidity as being desirable for this type of storage and commented that the dry bulb temperature in such caves is generally close to ground water temperature. He pointed out that in cave storages coatings are impractical and fire protection dictates the type of dehumidifying systems which can be applied.

The speaker added to the examples previously given on the application of industrial dehumidification. He pointed out that in industrial gas processing today dehumidification is employed to prevent the freeze-up of valves and piping controls in northern climates in winter. He pointed out the use of dehumidifying in the drying of air for pneumatic control

(Continued on page 60)

Automatic Ice Making Reduces Costs And Increases Production

H. L. DITHMER
Polar Ice & Fuel Co.
Indianapolis, Ind.

An outstanding semi automatic ice making operation has been installed very successfully, by H. L. Dithmer, Polar Ice & Fuel Company, Indianapolis, Ind. In previous articles in INDUSTRIAL REFRIGERATION and in convention papers, Mr. Dithmer has described this process. In this paper, presented at the annual Convention of The National Association of Ice Industries, he brings all the information up-to-date.

IN THIS type of plant, one man, working one shift, keeps all the machinery running, handles the water treatment, freezes, harvests and scores the ice and delivers it to the storage. Automatic controls start and stop the compressors as required by brine thermostats. Centrifugal switches on the agitators shut down the compressors if the agitators stop. Other cutouts protect the plant in case of high condensing pressure, too low suction pressure or water failure. For one-man operations, whole row grids and high pressure air agitation have been considered essential.

Installation of high and low pressure and water failure cut-outs and centrifugal switches on the agitators will usually afford more protection to a plant than one entirely manually operated, provided these controls are inspected and tested regularly. This makes it possible to leave the plant unattended at night with little prospect of any damage occurring.

Special Scoring Machines

Most of the Polar Ice plants are equipped with special scoring machines, which receive the block of ice on edge, score it and discharge it on end. These machines are located in the tank room and are fed automatically by plate conveyors on the dump. The first block that enters the scoring machine automatically trips a switch which starts the machine's operation, and it continues to operate long enough to score the block lengthwise and stand it on end ready for the cross-wise score. At that point the machine is shut off by a disconnect switch actuated by the scoring machine chain.

The next block delivered from the conveyor again automatically starts the scoring machine and it continues to operate until the second block traverses the proper distance to again actuate the cut-off switch.

In the meantime, the first block, by reason of the machine being started again, is propelled through the rest of the scoring operation. After leaving the scoring machine, the block passes through a dado saw, which trims off the white collar and makes all blocks uniform in length. Handling the ice on end in the storage not only doubles the capacity of the storage, but makes safer handling of each block, as they are pushed instead of pulled by the storage man.

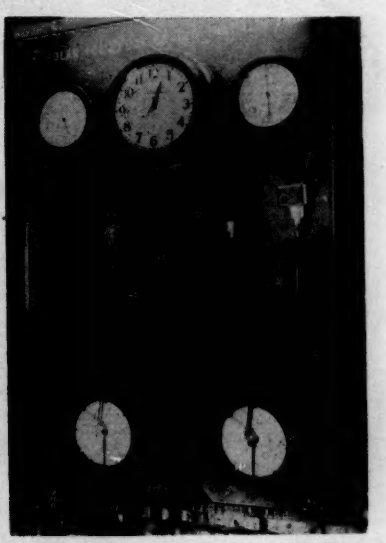
Sizing Equipment

In 1954 this company was faced with the necessity of replacing their sizing equipment. They decided to concentrate all sizing in one plant and deliver the finished product to the others. A whole block crusher was selected with push-button operated loading device and low head room sizer with 1/4-inch, 3/4-inch and 1-1/2-inch screens. The overrun from the last screen was dropped into a small crusher. Bag fillers were under each screen and one was also used for filling 20-lb. bags with the re-crushed over-run.

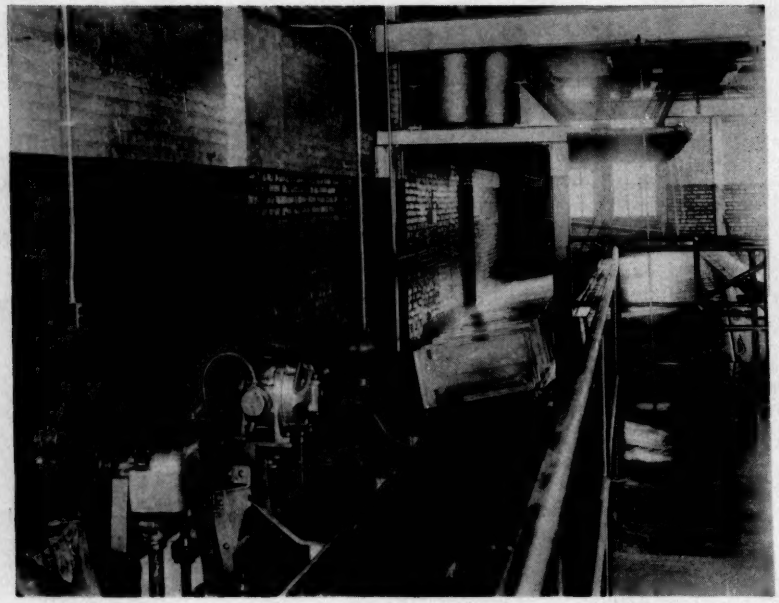
Within a short time after the arrival of the new sizing equipment, they became afraid that something might happen to the sizing equipment to put them out of business because they had concentrated practically all sizing operations in one plant. They, therefore, ordered an-

Paper presented at annual convention of National Association of Ice Industries.

Ice tank in Polar ice plant showing can grids, with water treating tank, compressed air tank, condensers, dehydrators and compressors.



The control board with pressure gauges, automatic cutouts, time-day relays, and recording instruments.



Twenty-eight blocks of ice are dumped by the Group Lift equipment onto the conveyor which feeds them, one at a time, into the scoring machine.

other machine of the same kind, but with a number of improvements that their experience indicated would be desirable.

When the second sizer arrived, they didn't have enough room to install it, so in the fall of 1954 they rebuilt a season storage. They raised the floor to the level of the day storage, dropped the coils and put in a low ceiling. This room is 41 × 78 feet and is devoted entirely to sizing and filling 20 and 50-lb. bags, and storage of 20-lb. bags.

These two sizers are set opposite each other and one man can load both crushers. A bag tyer is between the two screens and bags can be placed on it from either sizer. Leading away from the tyer is a 16-inch wide belt conveyor 20 feet long. The second conveyor leads to a small door opening on to the loading platform. When routes are being loaded in the morning, no ice is taken off the conveyor as it is sized. The "stackers," as the sized ice storage men are called, at that time add ice to the belts to expedite loading. Roller conveyors which extend into the trucks take the 50-lb. bags into the route trucks. During the day the stackers take the bags off the belts and stack them vertically four high. Stacking in this manner makes handling easier.

Storage Room

The storage room for 50-lb. bags is divided in half by a batten fence reaching to the coils. The purpose of this fence is to keep the inventory fresh. Bags tend to frost over and freeze if kept too long and the fence acts as a sort of bin.

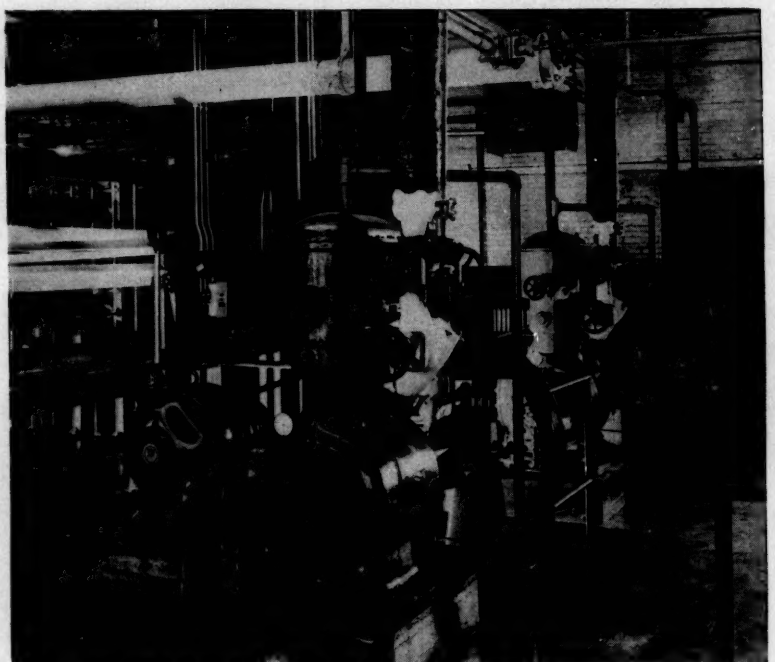
The over-run ice that is recrushed in the small crusher is picked up by screw conveyor bag fillers and 20-lb. bags for vendors are filled there, tied by machine, and stacked in warehouse carts, 50 to a cart. The 64 carts on hand allow them to carry an inventory of 3200 20-lb. bags. With additional bags stacked on the floor for special holidays, this size inventory has allowed the elimination of all overtime and Sunday work. The warehouse cars are wheeled out on the loading platform and the bags are then manually loaded into insulated trucks for delivery to retail plants and vending stations.

Almost all of the sized ice is frozen only 24 hours. A shell is produced that is prefectly clear, weighing 280 lbs., and there is less snow because the crusher teeth take a bite, instead of grinding through the entire thickness of the block. This tends to break the ice instead of crushing or grinding it.

Compressors in these plants were furnished by The Frick Company and the automatic controls by Allen Bradley.

Personnel required to handle the operation at the peak consists of one man to load the crushers, three baggers, two stackers and one part-time stacker for loading trucks after the regular crew has left for the day.

In the first 43 weeks of 1956, 214 more tons of ice were handled than in the same period in 1955, with a saving of 2399½ hours.



Two 8 by 8 Frick compressors, under automatic controls, carry the cooling load. Left middle of picture gives view of direct expansion air dehydrators. At upper right center on wall are electric capacitators giving power factor correction.

Frozen Food Convention Panel Discusses Refrigerated Storage Efficiency

AMONG the important discussions at the National Frozen Food convention at Miami Beach, Fla., was one on low temperature operations, conducted by a special panel session comprised of leading industry members, experts on insulation, and product handling. Increased plant efficiency at production and warehouse levels was stressed as the best means of competing with non-frozen foods. The session was moderated by Gordon R. Exley 2nd., management consultant from Bryn Mawr, Pa.

This panel emphasized increased plant efficiency at production and warehouse levels at Frozen Food convention. Panel consisted of W. Norbert Engels, J. E. Watkins, the late Oscar F. Stauder, J. R. Marchase, Gordon R. Exley 2nd., J. R. Hooper, John H. Price Jr., Harold J. Waite.

Oscar F. Stauder, Creamery Package Manufacturing Co. of Chicago, spoke on various types of refrigerants, compressors, and condensing equipment. According to Mr. Stauder, the best type condensing equipment depends on the source of water supply and means of disposition. If water is plentiful and there are adequate means of disposal, the best condenser is the open end vertical shell and tube, or the enclosed type shell.

If the water supply is limited or costly, an evaporative type was said to be more practical. The use of an all prime surface coil was said to be more popular in recent years, particularly where water contains soluble solids in considerable quantities.

Citing the lowering of the nation's water table and serious water shortages in some areas, Mr. Stauder said that a combination cooling tower and evaporative system could be a practical means of solving the problems created when plants had been built with a plentiful, inexpensive water supply in mind, and had to convert to operate with expensive or inadequate water sources.

Cooling Methods

J. E. Watkins, Maywood, Ill., spoke on various cooling methods such as under the floor, from the ceiling, and with coils or fins. He said that better sealing of frozen food packages was a factor resulting in less expensive ceiling units being more satisfactory. He also pointed out that under the floor units cost more and produce less air flow. Various methods of defrosting mentioned by Mr. Watkins were:

1. Prevention by spraying cooling surface with brine.
2. Heat defrosting.
3. Controlled introduction of outside warm air.
4. Hot gas from within the refrigeration system.
5. Spraying of water over cooling surfaces at intervals.

J. R. Marchase spoke on economy of operations, which he said were only as good as the maintenance methods and personnel. The best personnel, he said, were those who were present during the installation of equipment. He told how it is important for maintenance personnel to be thoroughly familiar with the purpose of their work, and to be loyal to the employer. Some of the troubles which he cautioned refrigeration men to be on the lookout for, were accumulation of excess oil on equipment, lack of oil, dirty condensing surfaces, high condenser temperatures, and lack of attention to magnetic starters.

J. R. Hooper, Hooper Conveyor Co., Brookfield, Ill., said the purpose of a refrigerated warehouse is to receive, hold, assemble and ship merchandise. Speaking on automation, he said that it could prove very effective when the merchandise was all in one type and size container. For handling of different size and shape containers, he said that automation could be applied to advantage in many instances with proper study of each individual situation.

He said the advantages of a simple telescopic conveyor from a fixed point were conservation of space and less insulation problems. Special inclined holding racks were recommended for moving and storing merchandise while being held. Mr. Hooper pointed out that in today's frozen food operations, 80 percent of the in-warehouse movements are caused by the 20 percent of slow moving specialty items.

John H. Price Jr., Pittsburgh Corning Corp., Philadelphia, spoke on soil conditions, saying that the type of insulation between floor and soil should be varied to meet the individual conditions; but that the chief problem is to keep soil adjacent to the insulation above 32 degrees.

In summing up the panel comments on automation, Gordon Exley 2nd said that all warehouses should have as much automation as the situations would permit and as much as the operation could afford.

Defrosting Frozen Bread

A REPORT on "Effect of Temperature and Relative Humidity on Rate of Defrosting of Commercial Bread", has been made by J. W. Pence, N. H. Standridge and M. J. Copley, of The Western Utilization Research Branch. The report states that the rate of defrosting is known to be important, and both temperature and rh significantly affected the rate in the tests reported. Rate increase due to rh is caused chiefly by the higher heat content of the air. Increasing air temperature consistently decreased defrosting time. Best overall results were obtained at 120 F and 50 to 60 percent rh. Warm air has the two-fold advantage of causing faster defrosting and lowering humidity with less trouble from condensation. Rapid defrosting by microwave heat produced incomplete refreshing and damaged wrappers, and the bread firmed at room temperature almost as fast as bread defrosted at room temperature.

Heat Pump Shows Definite Fuel Savings In Portland Office Building

OUTSTANDING fuel savings are possible by heat pumps on the big job-engineered systems, according to operation figures on the 540-ton heat pump installed in the 12-story Equitable Savings & Loan Building in Portland, Oregon. This system is unique in that it is completely instrumented to obtain accurate data for cost studies. The installation was described in the October 1954 INDUSTRIAL REFRIGERATION.

One-Year Analysis

According to a one-year analysis made by the consulting engineer, J. Donald Kroeker, the entire building was heated for a full year with an expenditure of only $774 for electrical energy, including demand charges. By comparison, oil heat would have cost an estimated $3,430; district steam, $4,930.

This low cost of heating with the heat pump becomes even more startling when the size, construction, and hours of occupancy of the building are considered. Architecturally, the Equitable Building was the first aluminum-clad office building in the United States. It rises 200 feet above street level, has a floor space of 212,000 square feet of which 148,711 square feet are rentable air conditioned areas. Its volume is 2,275,000 cubic feet.

Designed by Architect Pietro Belluschi, the building has a reinforced concrete skeleton, curtain walls and 36,700 square feet of heat-absorbing double-glazed windows (much thinner walls and much more glass than most office buildings.) In addition, the structure is in use from 8 a.m. until 10 p.m. As a result, the heating system operates during longer than average occupancy.

Comparative Figures

Boiled down to comparative figures, the total cost of electrical energy for heating (including demand charges) amounted to .52 of one cent per square foot. For cooling, the cost went up to 3.85 cents per square foot of rentable floor space. These costs were calculated on a power rate of 3.3 mills per kilowatt hour and a demand charge of $1.10 per kilowatt. Total costs, including salaries and other chargables, averaged only 2.1 cents per square foot for heating—while the cost of conventional heating in five representative Portland buildings amounted to 7.74 cents per square foot during the same period. On the cooling side, total costs averaged 9.2 cents per square foot, compared with 16.9 cents for the average U.S. office.

By-Product Costs

These cooling costs could have been made even lower had "by-product heating" been charged to heating instead of to cooling. However, when both cooling and heating were required in different zones of the building at the same time, the "waste" heat obtained from the cooling cycle was used in areas calling for heating. As a result, 37 per cent of the energy used for heating was obtained as a by-product of cooling—and was charged to the cost of cooling.

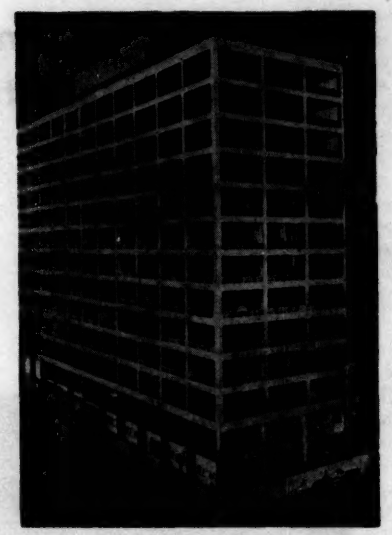
Electrical energy consumed totaled 154,431 kilowatt hours of heating and 745,044 kilowatt hours for cooling (including 89,370 kilowatt hours used for cooling which provided the "by product heating").

In comparing small "packaged" heat pumps with the larger job-engineered systems, A. C. Menke, vice-president in charge of sales of The Trane Company, pointed out, "Packaged systems are not designed to take advantage of such items as waste heat from the cooling cycle. However, built-up heat pump systems for large buildings that require both heating and cooling at the same time, can also take advantage of favorable local conditions."

Uses Well Water

For example, the Equitable Building's system uses well water from strata at different levels and temperatures. When the cooling load is greater, water from the cool well (57 F) is pumped through the condenser circuit. After this water has picked up heat in the condenser, it is circulated through the heating coil of any zone requiring heating, and is then disposed of to a warm well.

When the heating load is greater, water from a warm well (63 to 65 F) is pumped into the evaporator circuit. After it has released heat to the evaporating refrigerant, it is pumped through the cooling coil of zones requiring cooling, then through a heat recovery coil in the exhaust air duct, then through a preconditioning coil in the intake duct, and finally, down the cold water well. In other words, the wells are used as sinks.



Equitable Office Building, Portland, Oregon.

Frozen Bakery Products

EXTENSIVE researches on freezing of baked goods have been reviewed by Wm. H. Cathcart, National Bakery Division, A & P. He believes that consumer acceptance of frozen bakery products has been amply demonstrated, but he does not see a shift to freezing for a large portion of production. However, he points out that even though only a small percentage of production is frozen, it may be a substantial tonnage.

Large central bakery plants may develop, he said, similar to freezing plants for other products. The process of freezing unwraped individual slices may develop — thus, fast freezing could be used, with advantage, and very little staling would develop. The heels, of course, could be left out of the consumer package. (Perhaps very long loaves with very few heels could be produced.)

The experience of Arnold Bakers, Inc., comes to mind, which has frozen and distributed over eight million pounds of rich-formula firm-type breads and soft rolls over the past four years. USDA has recently called attention to the fact that bread is highly nutritious, rich in vitamins and minerals. Bread flavor is getting attention in research at USDA's Branch in Albany, Calif. The downward trend in per capita consumption may be stopped before long, with alleviation of the wheat surplus problem. — TRRF Bulletin.

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Operating engineers of all refrigerating plants are invited to affiliate with the National Association of Practical Refrigerating Engineers, Inc., an educational association, "not-for-profit".

From the President's Desk

Educational Objectives of NAPRE Partially Achieved Through Regional Meets

THE dissemination of information concerning refrigeration and refrigerating engineering is one purpose of NAPRE's existence. This purpose is attained in part when chapters in any one region promote and participate in a regional Conference. First of such conferences will be held this year at Milwaukee, Wisc., on April 26, 27 and 28.

Milwaukee Chapter volunteered to be the host at this coming Midwest Regional Conference. For a chapter that was chartered barely two years ago, this is quite an undertaking. Officers and directors of NAPRE not only take this opportunity to commend the new chapter at Milwaukee on their incentive and ambition, but also congratulate them on their willingness to shoulder an important function of this nature.

Green Bay and Chicago Chapters are also to be commended for their active participation and support to Milwaukee in the undertaking. It is to be expected that the NAPRE chapters at the Twin Cities, Sioux City, Iowa, Greater Kansas City, St. Louis, Mo., Indianapolis, Ind., and Detroit, Mich., will send delegates and support this regional activity.

Convention Planning

Chicago Chapter, under leadership of Chapter President Nicholas M. Downes, who is also the National Convention Chairman, is busily engaged in making arrangements incumbent upon them for the 48th Annual Meeting of NAPRE. This convention will be held at the Del Prado and Sherry Hotels in Chicago on November 18 through 21. The arrangements are being made at the national level for NAPRE to cooperate with the All Industry Refrigeration and Air Conditioning Exposition to be held the same dates at the International Amphitheatre, Chicago.

While plaudits are being handed out, your chief executive takes this opportunity to commend the vice-presidents in particular for their efforts in the conservation of members and their assistance to the national treasurer in rounding up the annual dues. Other officers and directors are active with these two "assistant presidents" in promoting the purposes and objectives of the association and guiding the activities of the many committees.

Refrigerating Problems

Are you overcome with refrigerating problems? If you are, how about sending your problems into the Question Box. I don't believe there is one problem in the refrigeration field that at least one member of the NAPRE can't help you solve.

The Chapter Report Award

George B. Bright Chapter (formerly Michigan Chapter No. 1) deserves the chapter award recognition for their report which would have been published this month under our News Notes and Chapter Activities. Their report, however, turned out to be in much detail and was, therefore, not published under that heading. It is being treated as a short feature article by the publisher of our official organ. Congratulations to the Detroit scribe. Secondary honors of the month go to Fred Herr of Los Angeles for his report.

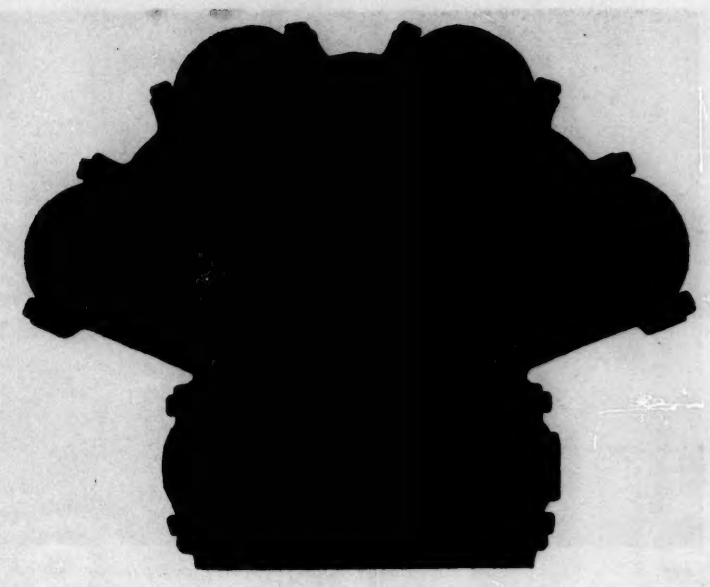
Chapters Give Recognition To Industrial Members

Los Angeles Chapter was first to honor an Industrial Member in its area. At their annual January social, guest of honor was Hal Jarvis, representative of Refrigeration Engineering, Inc., a Sponsoring Industrial Member. The chapter president officially presented Jarvis with a membership certificate for his firm and cited the activities of "Recold" in the industrial refrigerating field.

Chicago Chapter followed suit and honored representatives of H. A. Phillips & Co. (a Sustaining Member), and the J. E. Watkins Co. and Saunders & Co. (Contributing Members) on March 12. Bill Richards represented the Phillips organization on the program, while Russ Bass and Dick Saunders represented their firms. Local representatives of other Sustaining Industrial Members (MMM, Inc., Sporlan Valve Co., and the Vilter Mfg. Co.) were tendered invitations and promptly put in an appearance. All chapters are urged to single out their contributing Members at an affair each year, and use the same means to focus attention on local representatives of the other two grades of membership.

Bert C McKenna

In the Prevention of — Multi-Cylinder Compressor Failures



Make Thorough Annual Inspections

The Educational Committee
NAPRE

EXPERIENCED engineers will recognize the necessity for making a thorough annual inspection of the high-speed multi-cylinder compressor, just as much as they were indoctrinated in making such inspections of the popular vertical single-acting compressors and its "Workhorse" predecessor, the horizontal double acting machine. However, youngsters entering the game today and rapidly advancing to positions of responsibility for such equipment, may fail to recognize the fact that this high speed pump requires the same care as the high compression, torque building, internal combustion engine in their automobile.

Actually, the term "annual" is even pretty hard to define these days. The accumulation of operating hours per unit will vary from plant to plant. Therefore, it will be necessary for the engineer to log the hours of operation and to perform thorough inspections of his compressors in accordance with the number of hours which the manufacturer specifies as being the equivalent of an "annual" period of time. Generally speaking this is approximately five to six thousand hours.

In order to inform himself of the more important aspects of an annual inspection, the engineer has only to refer to the booklet of operating instructions provided by the builder of a modern compressor. Manufacturer's instructions not only contain a description of the general construction of a multi-cylinder compressor, but as a rule they contain erection, testing, start-up, shut-down, operation, service and maintenance data in great detail.

Many of the instruction books contain detail information on controls, their wiring circuits, motors, their starters and wiring diagrams, drives and data on miscellaneous accessories. A good engineer will obtain and keep such an instruction book handy as a reference text against which to check his own competency.

Annual Inspection Practice In Modern Cold Store Plant

This paper will describe procedure followed in an established practice of inspecting compressors annually in a modern cold storage and food freezing plant at Chicago Illinois. Data given pertains only to the one type compressor unit found in this plant. It is intended that the description be general and is not to be accepted as criteria to be followed in every plant or in connection with all makes of compressors.

The plant in which this high-speed multi-cylinder compressor to be described is located, is a pioneer one-story structure built in 1951[1]. An annex was completed in 1955[2]. The original plant was equipped with three 100-hp rotary booster compressors and four 100-hp vertical single acting machines. Freezer capacity today is 3,600,000 cu ft.[3].

As additions were made to the warehouse facilities, three more rotaries were added to the plant for booster compression, while four multi-cylinder high speed compressors were added to handle high stage requirements. All are rated at 100 hp.

Blast freezing has been incorporated in the facilities since its original construction. Liquid ammonia

The Committee acknowledges and expresses its appreciation to officers and personnel of Continental Freezers of Illinois, Inc., and Burge Ice Machine Co., Inc., both of Chicago, and the Vilter Manufacturing Co. of Milwaukee for their cooperation, technical advice and other assistance in the preparation of this article. Figs. 5 thru 11 courtesy of the Vilter Manufacturing Co.

[1]"Modern Design Facilities Feature New One-floor Freezer Storage"; ICE & REFRIGERATION, August 1951, Page 47.

"New Freezer Storage Incorporates Latest Design Features"; ICE & REFRIGERATION, April 1952, Page 25.

[2]"Continental Freezers Adds New Storage Facilities for Frozen Foods", Ralph J. Epstein & A. J. Sander, A. Epstein & Sons, Inc., Engineers, Chicago; INDUSTRIAL REFRIGERATION, August 1955, Page 19.

[3]Directory of Public Refrigerated Warehouses; NARW, 1956.

Fig. 1 — Two of six FES-Fuller rotary booster compressors which make up an integral part of the two-stage system employed by Continental Freezers of Illinois, Inc., Chicago, Illinois.

pumps operating on a recirculation principle have supplied refrigerant to both freezer and low temperature storage evaporative surface in the original structure. Incidentally, evaporator units utilize a liquid sorbent solution to maintain frost free prime surface. Recirculation system for the annex employs the principle of applying discharge gas pressure to the recirculating system in order to keep the evaporative surface fully flooded, and unevaporated refrigerant constantly at work for greater efficiency.

Pump Makes Given

Booster compressors are FES-Fuller rotary type, consisting of one each A135, A150 and A200, and three A175 models (See Fig. 1). These boosters which take their suction from a liquid trap, discharge into the conventional liquid cooled inter-cooler. Intermediate suction is taken into either four 10x10-in. Baker Ice Machine Company two-cylinder, VSA mechines, or four Model 430 Vilter multi-cylinder units (See Figs 2 & 3), or combinations of both. The plant has one standby unit for each stage.

Discharge from the high stage machines is to two 400-ton Niagara evaporative condensers located on the roof of this one-story structure. The receiver is located directly beneath the condensers at the engine room floor level. Evaporative surface consists of Niagara "No-Frost" units. The recirculation system in the annex is the J. E. Watkins Co. make.

Annual Inspections Planned

As is customary in major industrial refrigeration plants, there is close liaison between engineering and warehousing departments in this establishment (See Fig 4). Management is aware of the necessity for periodic inspections and overhaul of its equipment in the engine room. Just as it is necessary to give similar consideration to materials handling equipment, office machines, etc., the "front office" here takes bonafide interest in its engineering facilities. The president of the firm is on record to the effect that the Engine Room is his showpiece[4].

In the engineering office itself the operating time of equipment is logged carefully. There are no recording devices. Management insists on personal inspections, feeling that recorders permit slip-shod operating inspections and logs[4]. Operating periods of the machines are rotated as much as practicable with the demands on the refrigerating plant. Major objective in the rotation of the equipment is not only with a wiew toward giving equal wear, but much emphasis is placed on timing annual inspections and overhaul with winter or slack refrigerating periods in the warehouse.

When the machinery history cards on high stage compressors in this

[4] "Interesting Features of New Cold Storage Plants", Don A. Parkhurst, Engr., Burge Ice Machine Co., Chicago; NAPRE *Operating Data Book*, 1952, Pages 63 and 67.

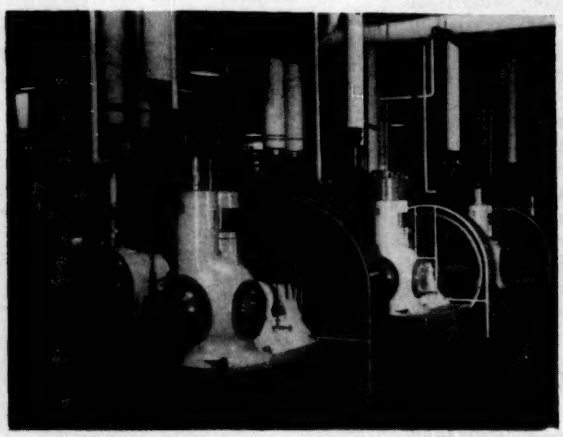
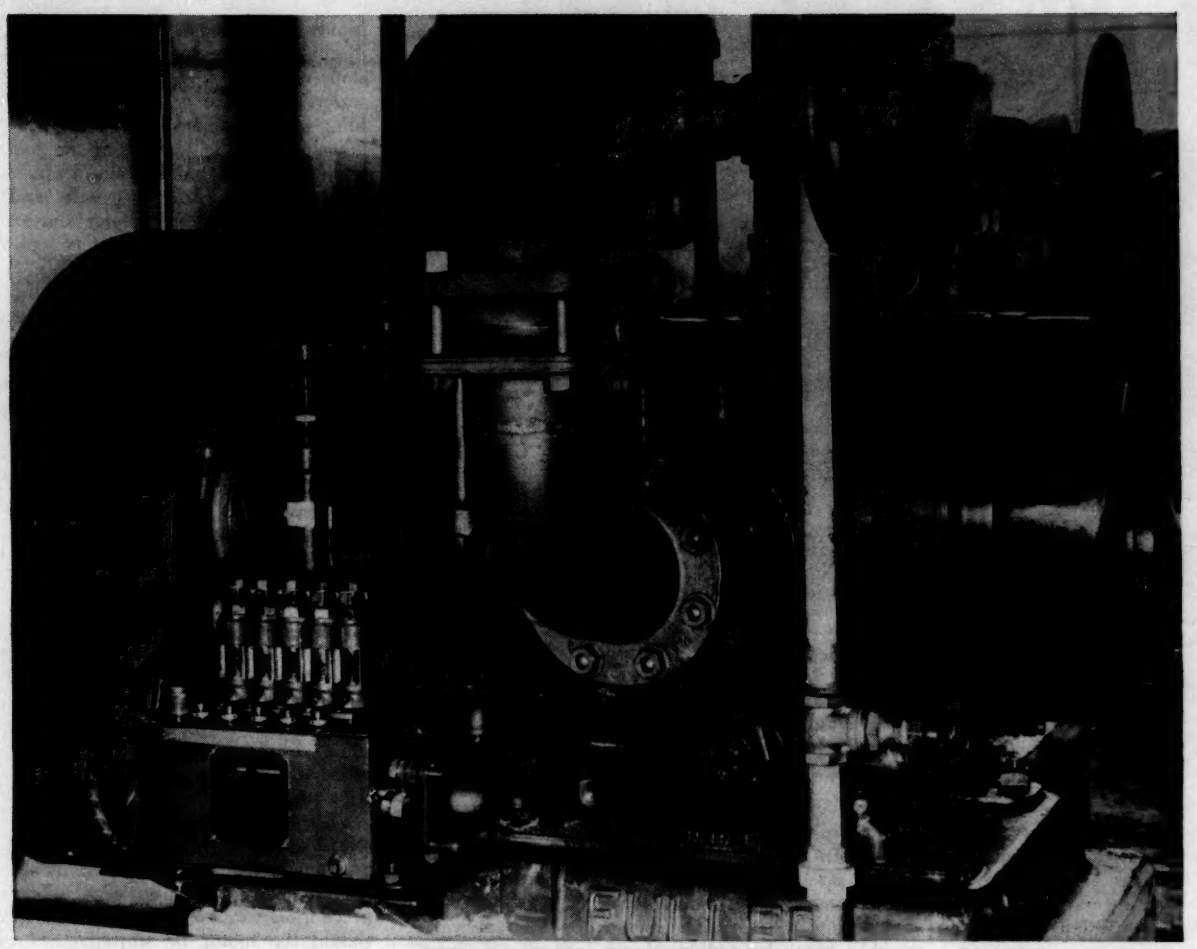


Fig. 2 — Four Baker VSA units which provide a portion of the high-stage compressing requirements at the plant under discussion. Three of the six rotaries are located behind these machines. Motors are by Ideal Electric and Manufacturing Co.

Fig. 3 — Three of four 8-cylinder Vilter VMC high-stage compressors used at Continental Freezers. These units provide roughly two-thirds the high stage compression potential of this plant. A Watkins recirculator is located at left, rear.



HOW ONE FOOD PLANT INCREASED OUTPUT 50%

Increasing demands for Morton Pies created a production problem at Morton Frozen Foods Eastern Plant at Crozet, Virginia. The solution was installation of a new freezing tunnel and relocation of processing equipment. To provide the necessary power two Fes-Fuller Rotary Booster Compressors were added.

In addition, power for the new 85 ton freezer storage is now handled by a two-stage compressor system employing a Fes-Fuller Rotary Booster. A capacity reducer on this Booster plus a close connection of the high stage suction with smaller machines permits variation in capacity to fulfill required load changes.

Like so many other food freezing plants, Morton Packing has found Fes-Fuller equipment to be reliable under all conditions and require a minimum of maintenance. When you need increased refrigeration facilities, it will pay you to investigate the economical and reliable Fes-Fuller Rotary Booster Compressor Systems.

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Fig. 4 — Management makes engineering problems its business. Vice-president and General Manager, Jack L. Hemery (right), pays a visit to the machinery room to observe first-hand some of the annual inspection proceedures. At left, Geo. E. W. Benson, Maintenance Foreman, puts finishing touches on a mechanic's gasket removal effort, while Wm. L. Meyer, Service and Erection Engineer discusses the valve inspection with Chief Engineer Jos. G. Farrell and Hemery.

plant indicated that an annual inspection was in order, the Chief Engineer notified the Company's operating Vice-President and suggested several dates on which engineering maintenance personnel would be available to accomplish the work.

Management checked with sales and warehousing operations, and a date satisfactory to both engineering and warehousing functions was agreed upon. Even the purchasing department was consulted, as the Chief Engineer requisitioned the services of the field service engineer from the manufacturer's authorized contract service firm. The Chief and his management felt this was a wise procedure since the machines to be serviced were completing their first year of operation, plus the fact that they had just logged enough hours so as to be beyond the contract guarantee period. Following initial inspection of the first unit, thereafter all future service, inspection, and maintenance will be performed by the plant's own maintenance crew.

Shutdown Procedure

The plant has a regular shutdown procedure for each type of machine and for operating routines. Following are the steps carried out by the Watch Engineer in securing high-stage compressor No. 5 for its first annual inspection service:

(1) The Watch Engineer shut down the machine by pressing the stop button on the compressor motor control cabinet.

(2) He closed the suction valve located overhead just off the intermediate pressure suction header. (There is another suction valve located at the compressor itself)

(3) Started the compressor again (Start button on motor panel).

(4) Close the compressor suction valve.

(5) Continued to run the compressor to pump a vacuum in the crankcase (10 to 15-in., Hg.).

(6) Opened the crankcase pump-out valve to aid in removing all ammonia gas from the cankcase, especially that which has been entrained in the oil.

(7) Closed the compressor discharge valve.

(8) Stopped the compressor.

(9) The engineer then secured the discharge valve located at an overhead discharge header.

(10) He then secured the oil return valve between the discharge trap and the compressor crank case.

(11) The compressor was then vented by taking off the high pressure gauge at the machine, a cock being closed in the line prior to the gauge removal. A hose was attached to the gauge line, the cock opened and the ammonia gas remaining is blown off through the compressor discharge valves and the discharge stop valve to a bucket containing water. When the crackling and bubbling had stopped, the hose was taken out of the water and the machine turned by hand to admit air.

(12) Opened safety switch and tagged cut compressor motor starter. Disconnected power to safety controls on the compressor.

The compressor was then considered pumped down and isolated from the rest of the system, and ready to be serviced.

Dismantling

Pump down of the unit for inspection was accomplished by watch engineer a day previous to the start of this inspection. In this particular case, the field service engineer representing the manufacturer and the contract representative, together with the maintenance foreman for the owner, actually performed the inspection and overhaul. Dismantling procedure was as follows:

(1) Removed the safety guard from around the V-belt drive.

(2) Sliding motor rails are provided. These were loosened and V-belts removed.

(3) The V-belt set and guard was stored out of the way of maintenance and operating operations. Removal of the belts serves also as a safety precaution against any accident should the motor be started.

(4) Drained the oil from the crank case.

(5) Secured the jacket water and drained. Opened all jacket water connections in order to remove the heads (see Fig. 5)

(6) Removed the cylinder covers (heads) (see Fig. 6), observing the following precautions:

All $\frac{5}{8}$ x $2\frac{1}{2}$-in. cap screws were not removed at once. Two cap screws opposite one another were removed and a special set of long studs provided in their place. These studs prevent the head from dropping to the floor as it raises off the block, when all the cap screws are removed. (When completely loosened, there is about a one inch raise to the cylinder covers caused by the safety head springs.)

(Caution—mechanics should keep their face away until the head is free and no NH_3 is present. Some ammonia is always difused with the air in the compressor and removal of the head could cause discomfort and possible injury to the mechanic inhaling these fumes.)

(7) Removed springs and safety head assemblies (Fig 7), taking care

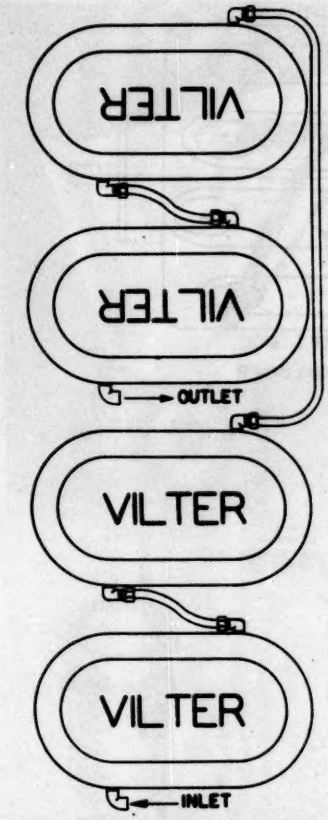


Fig. 5 — Diagram of water jacket connections for 8-cylinder VMC 430 booster compressor.

to note the numbering system and to keep all parts matched with the respective cylinders (see Fig. 8).

(8) Removed hand hole cover and sight glass assembly (see Fig 6).

(9) Removed the connecting rod bearing caps (see again Fig 7), taking care not to drop the piston assembly into the crank case.

(10) Removed the pistons thru the top of the cylinders.

(11) Although no wear was expected with this machine, in addition to inspection of cylinder liners for scoring or other defects, micrometer readings were taken. Readings were logged and compared with those of the manufacturer given at the time the machine was installed. In an older machine, they would be compared with readings of the last overhaul period as well.

(12) Cylinder liners showed no measurable wear. In machines with years of service, had the liners been worn, liners would have been replaced.

Passed Certain Inspections

At this point in the overhaul, any service to the capacity control, replacement of the shaft seal, main

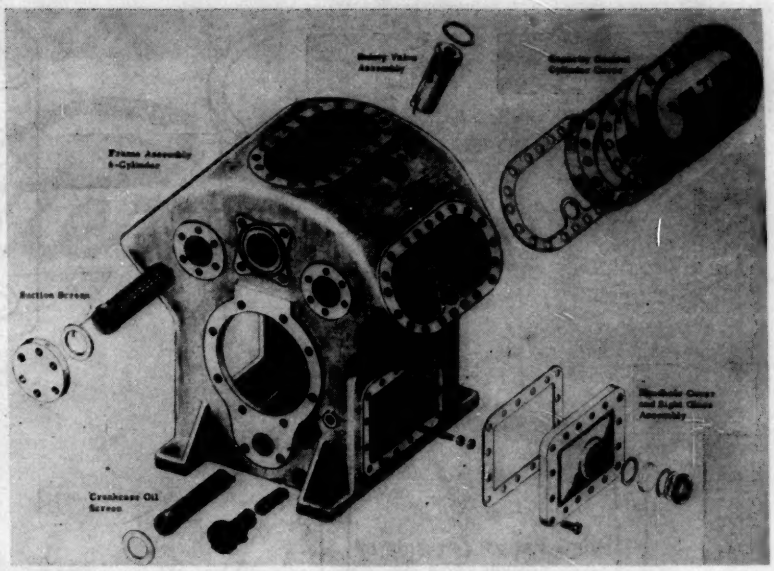


Fig. 6 — Exploded view of compressor frame assembly. Although unit pictured is a 6-cylinder machine, parts to the 8-cylinder unit described would have the same relationship to the frame.

bearing adjustments, etc., would have required more dis-mantling. The fly wheel would be pulled, seal removed, oil pump cover and filter sump, crank shaft removed and main bearings examined, had the engineer suspected excessive wear at these points. Tip off to such wear around

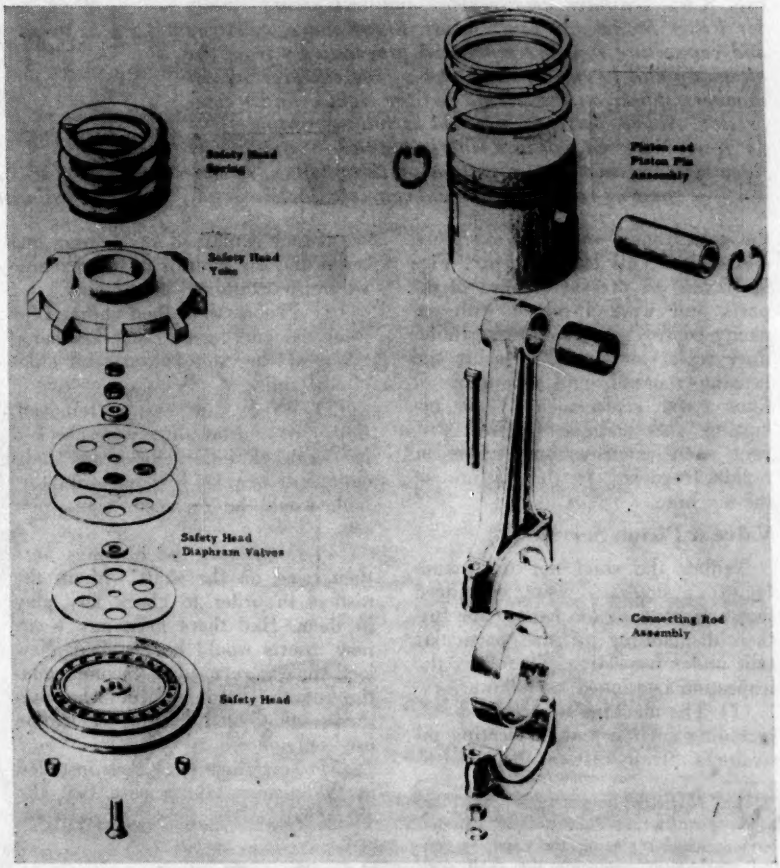


Fig. 7 — Assemblies which make up the complete safety head and piston units in the subject compressors.

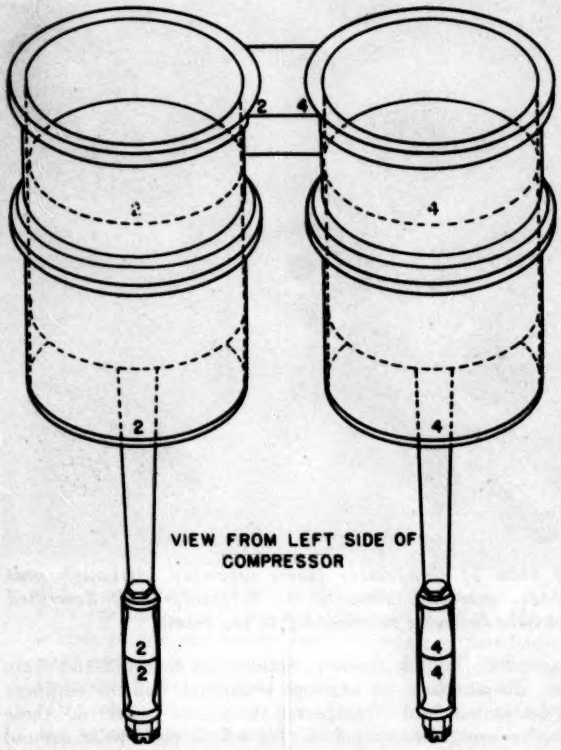
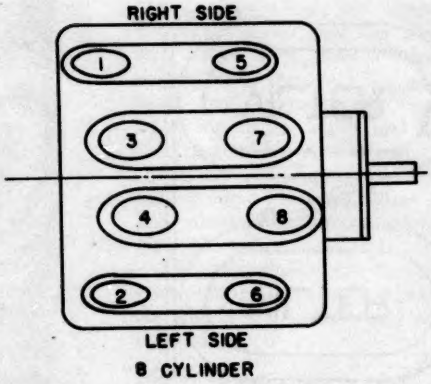


Fig. 8 — Cylinder arrangement and numbering system for Vilter Model 430 compressors. Right above, cylinders and connecting rods are numbered progressively from the oil pump end to the flywheel end of the compressor. All numbers appear on the left side of the eight cylinder compressor. Above, parts are stamped as follows: cylinders — on frame between cylinder liners; piston — on top, left side; cylinder liner — on bottom of skirt, left side; connecting rod — on rod and cap, left side.



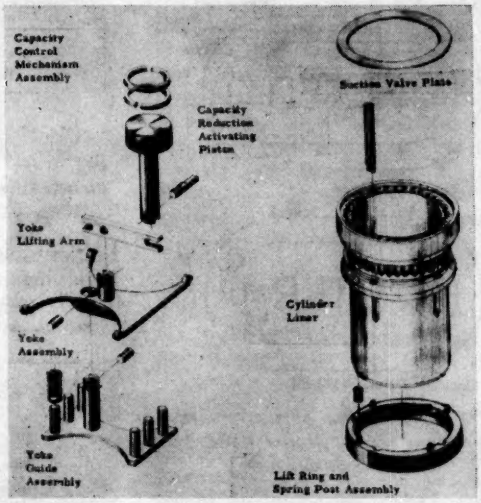


Fig. 9 — (above) Capacity control mechanism and cylinder liner assemblies for the 430 series.

the crank ends would be too much seal trouble, oil leakage, etc,[5]. Figs 9, 10 and 11 present an idea of the parts and work involved with capacity control adjustment or cylinder liner replacement, seal or shaft and bearing renewal, and oil pump or filter cover replacement. Good operating and maintenance will prevent such extensive inspections or repair frequency in the lifetime of the machine.

Valve & Piston Service

Neither the chief nor the manufacturer's engineer were convinced that any good reason existed for further dismantling of the particular unit under inspection. Therefore, the inspection continued as follows:

(1) The machine was cleaned out, including suction and lubricating oil strainers. Strainers were inspected to see if they contained any foreign material and the interior of the machine was also examined thoroughly.

(2) Pistons were then checked for wear, a micrometer reading being taken at the top, bottom and sides of each unit.

(3) Wrist pins were removed. Both pins and bushings were checked for wear. Had there been any indications of wear or if they were loose, both would be replaced, using new sets.

(4) Connecting rod bearings were then tried on the shaft without the pistons in order to check any play in them. Had there been any wear, new inserts would be installed. New lock nuts were used, a recommendation of the manufacturer who prescribes that such locking device be used only once.

(5) New rings were then installed in the pistons taking care that the chamfered edges were placed properly.

Valve Parts Checked

Valve assemblies then came in for inspection. Springs and diaphragms were checked for cracks, fatigue, etc. Seats were then inspected for wire-drawing. Suction valve ring plate was also inspected closely. Although there was no wear or damage or distortion, in the event there had been, the items would have been replaced with new parts. In the event of any wire drawing, both suction and safety head seats and suction ring plate are either ground-in or machined to a true surface and then the plate lapped into the seat with a good grade of lapping compound. Water base compounds which run down into the machine are never used. A grease type compound may be more easily removed from the machine, and the valve and safety head parts cleaned up.

Reassembly

At this stage of the annual overhaul most of the important inspections of the compressor and its miscellaneous parts have been made. The major reassembly procedure commences at this point. All new

[5]The NAPRE Educational Committee will present a paper at a later date on servicing and replacing the capacity control mechanism, replacing the shaft seal, adjusting the main bearings, adjusting the isolators, changing oil, charging NH_3, etc.

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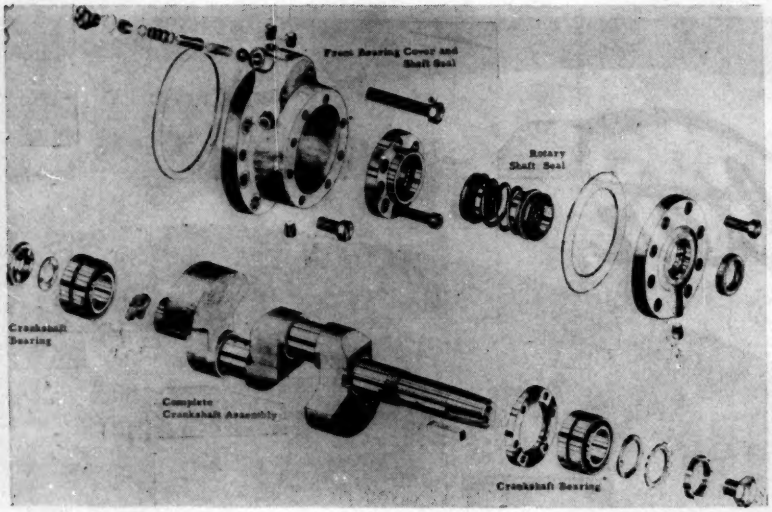


Fig. 10 — Above, shaft seal housing and assembly is pictured over the compressor crankshaft and bearing accessories.

gaskets were used throughout. The procedure followed at the plant described, is as follows:

(1) Entire piston and connecting rod assembly was reinstalled in the machine, and bearings made up tight.

(2) Valve gear was reassembled and replaced in the compressor, mating all assemblies with their corresponding cylinder. Refrigerant oil of the proper grade is used to lubricate the valve assembly, seats and in the cylinders.

(3) Cylinder covers are replaced over the long studs which serve as guides, making sure the valves stay in place and do not slip out of their positions. Cover cap screws were replaced and drawn down evenly all around. Two studs were replaced with the proper cap screws as the last step.

(4) Machine was turned over by hand as each cylinder bank was assembled to make sure nothing was left in the machine to obstruct the piston or interfere with the valve action.

(5) Jacket water connections were made up.

(6) Crankcase was filled to cover plate level with proper grade and make of lubricating oil. Filling plug in the crankcase was removed and a pipe and funnel rig inserted for placing oil in the compressor.

(7) Crankcase hand hole covers were replaced.

(8) Crankcase was then filled with oil (4½ gals, approx.) to the proper level indicated by the hand hole cover sigh glass.

(9) Replaced next were both suction strainer covers and the oil filling plug in the crankcase.

(10) Drive V-belts were then replaced.

(In the case of this machine a new set was not installed. The manufacturer of the belts provides a set of tables and an instrument to the engineer of this plant for adjusting his V-belt tension. The instrument measures the amount of deflection which can be obtained by a certain number of pounds pull, also recorded on the device. The deflection and the pounds of effort are transferred to a table from which it is determined whether or not sufficient tension is on the belt. Adjustments are then made at the motor slide to bring the proper tension on the belts. Should any of the belts require replacement, they are — with an entire matched set.)

(11) Replaced the drive safety guard.

Start-up

Reassembly having been completed, the compressor was considered ready for starting up. The maintenance foreman notified the chief engineer and the watch engineer that the machine was ready to go on the line. With an o.k. received

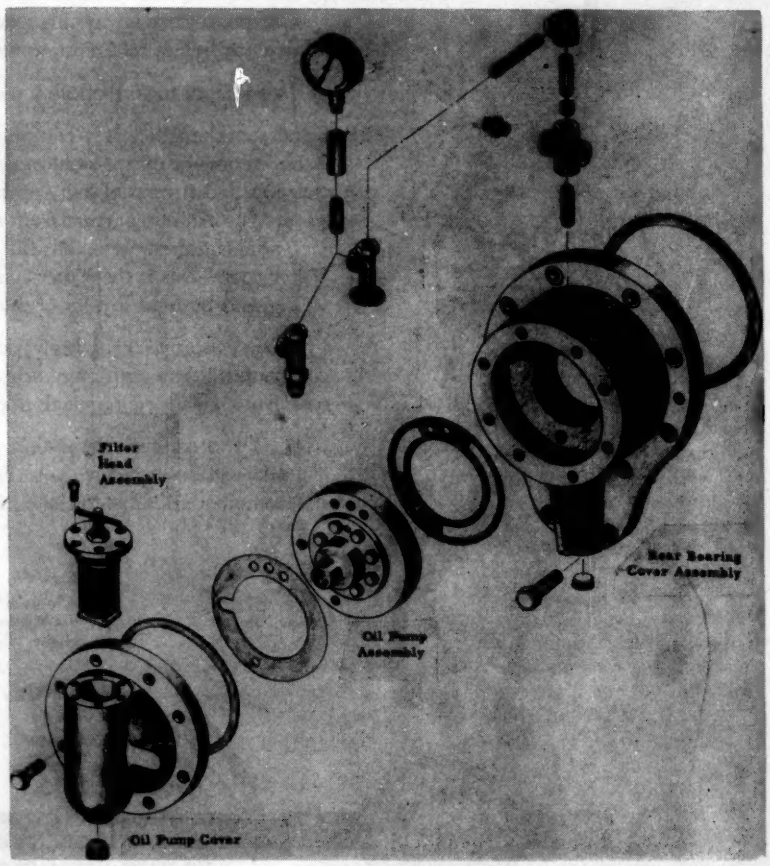
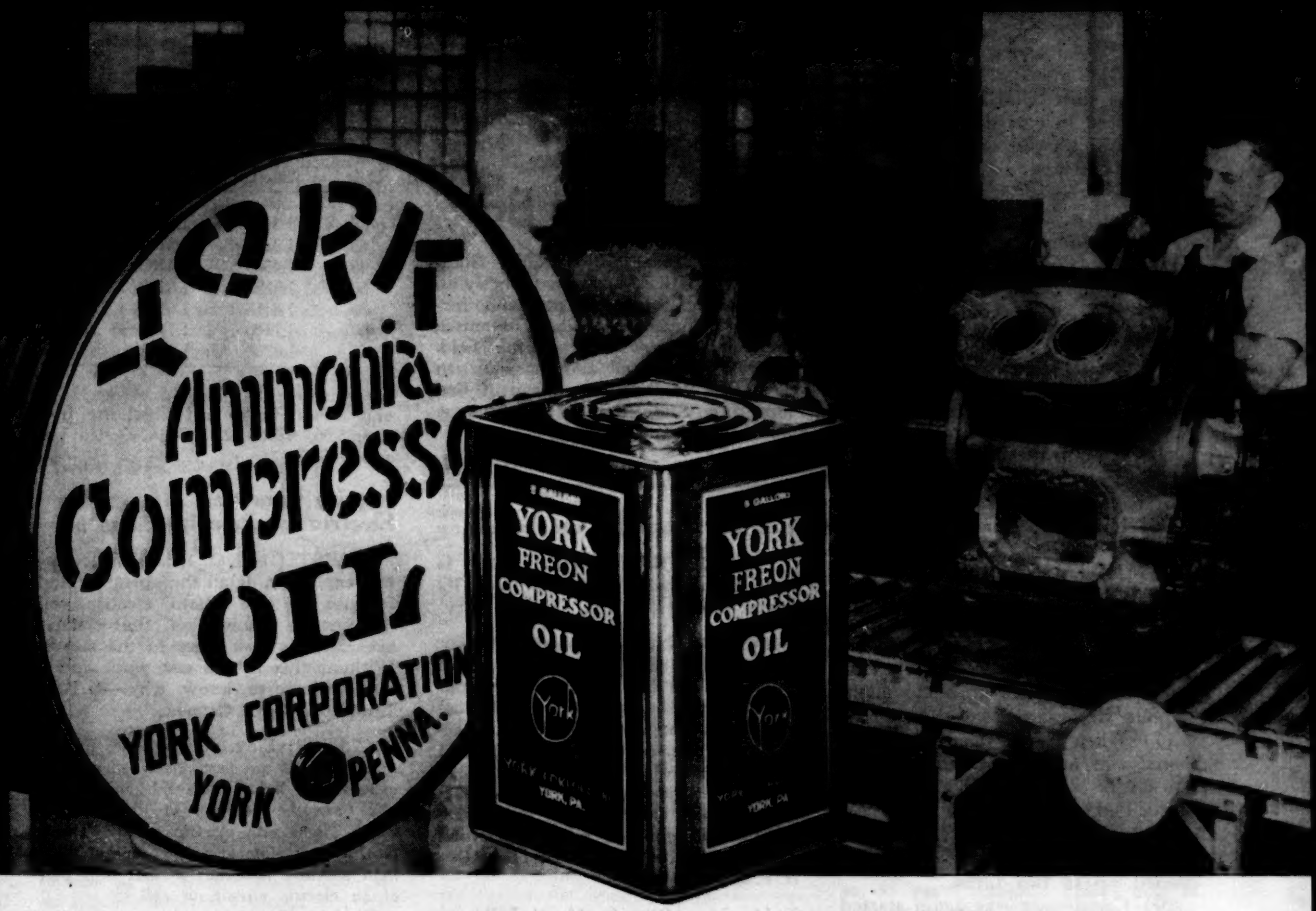


Fig. 11 — Left, oil filter, oil pump and cover assembly which closes up the opposite crank end from the flywheel and shaft seal housing.



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from the chief, who made an on-the-spot check to satisfy himself that everything was in order, the maintenance foreman and the operating engineer proceeded to test the machine and to start it up as follows:

(1) Suction valve at the manifold was opened; valve at machine only by a half turn.

(2) Hose was again attached to discharge gauge line and to bucket of water.

(3) Compressor motor starter and electric devices were energized and compressor turned over enough to evacuate air from unit by alternately pressing start and stop buttons before motor came up to speed[6].

(4) Discharge gauge was then replaced.

(5) Machine was then started up until discharge pressure reached 100 psig, when it was shut down and suction valve closed.

(6) A check was made for leaks using litmus paper (in some plants sulphur sticks are used).

(7) When it was determined that there were no leaks around any of the covers or parts which had been dismantled, the discharge valve was opened wide.

(8) The suction valve was then opened up to two turns.

(9) Compressor was again started up.

(10) The suction valve was then opened gradually.

(11) The valve between the oil trap and the crankcase was reopened.

(12) Suction and discharge pressures at the machine, oil pressure, and temperatures were compared with those of the system and the manufacturer's recommendations, respectively and found satisfactory.

The compressor now being restored to service and on the line with other machines, the watch engineers were given written instructions to observe the operation of the machine closely. In this plant such observation is made for four hours and then the machine receives the usual operating inspections prescribed for in the watch routine. The manufacturer's field service engineer, in reply to a question from the operating engineer, pointed out that if the machine heated up in a hurry, it would probably indicate that there was a bad valve job done or that the rings were too tight.

[6]In plants such as this which are equipped with efficient purgers, and in the interest of time-saving, many engineers have discharged this small quantity of air directly to the system, counting on their purgers to remove this non-condensible. The Committee will not pass on the merits of this practice.

NAPRE

Question Box

The National Educational Committee, NAPRE, answers monthly in this column, operating problems forwarded by members. The Committee appreciates answers from the field. Address questions and answers to Prof. Harold P. Hayes, Dean of Engineering, State Polytechnic College, San Luis Obispo, Calif.

Lithium Bromide Data Asked

QUESTION NO. 1161: What is lithium bromide and what are its characteristics?—J.B.S., Green Bay.

ANSWER: Lithium bromide is a salt formed by the combination of lithium and bromine. When dissolved in water it forms a brine which is highly desirable for use in dehumidifying air or in absorption refrigeration systems. In the latter case, it serves the same function as the more commonly used water-ammonia solution. Figure and tables at right give three properties (vapor-pressure, specific gravities, and specific heat) of lithium bromide.—H. P. Hayes.

Table 1 — Specific Heat: LiBr — H_2O Solutions

Concentration, % of LiBr by wt.	Specific heat Btu/(lb) (F)
40.0	0.591
45.0	0.550
50.0	0.512
55.0	0.477
60.0	0.444

Table 2 — Specific Gravity: LiBr — H_2O Solutions

% LiBr	Temperature C 25 C	30 C	40 C
30	1.2615	1.2588	1.2542
35	1.3183	1.3160	1.3112
40	1.3813	1.3788	1.3740
45	1.4505	1.4480	1.4432
50	1.5293	1.5260	1.5205
55	1.6165	1.6130	1.6072
60	1.7160	1.7120	1.7050
65	1.8305	1.8255	1.8170

(Ed. Note: Tables and Chart are from page 5-06, ASRE Data Book, Design Volume, 1955-56).

Inquiry Concerns Electric Eye Principle

QUESTION NO. 1162: Will someone explain in detail the operation and features of the photo electric cell (commonly known as the electric eye)? There is a glass in the sleeve. Without this it will not work and I am anxious to know why.—G.T.C., Hamilton, Ont., Canada.

ANSWER: Electrical properties of certain materials are particularly affected by exposure to light. Some substances actually have the property of directly converting light into electric energy. Therefore, it is possible to arrange one of these light sensitive materials so that it is part of an electric circuit, or *cell*.

For example, the inside surface of a glass bulb can be coated with silver, leaving one clear section through which light may pass. The inside silver surface is then coated with a thin layer of a light sensitive material such as potassium anhydride.

An electrode is connected to the silver and another electrode is installed, insulated from the silver. When light strikes the light-sensitive material a current is

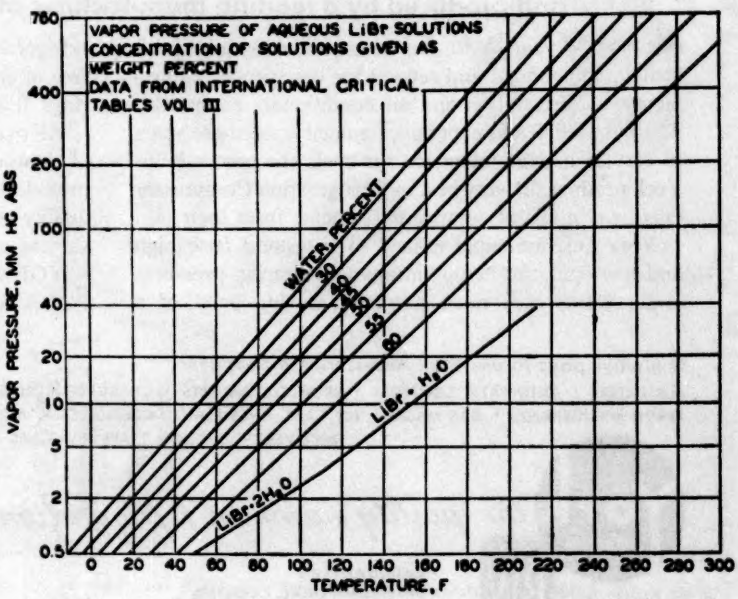

Fig. 1 — Q. No. 1161 — Vapor Pressure of Aqueous LiBr Solution.

generated and flows between the two electrodes. Although the amount of current is small, the signal can be used indirectly as a control device because of the sensitive quick response.

There are other variations of the light-sensitive principle which are called photo-voltaic cells and photo-conductive cells, but they serve the same basic purpose as the photo-electric cell. If it is remembered that the basic circuit consists of two electrodes, one of which is coated with a light-sensitive material, then the action of any given photo-electric cell can be traced. —H. P. Hayes.

Plastic Repair of Ice Cans

QUESTION NO. 1163: I have heard of a new development for the repair of ice cans using Fiberglas? Can you tell me something about this? —L.E., Chicago.

ANSWER: There is a new process which uses a combination of resin and Fiberglas. Briefly, the process is as follows:

The surface of the can is first cleaned thoroughly by brushing on a special solution. It is important that all rust particles be removed. A paste of resin and china clay is applied to the surface to be treated, particularly around rivets, and the surface is smoothed with the paste. After the paste had dried, a resin is applied, followed by Fiberglas and more resin. After a few hours the Fiberglas and resin congeal to a hard, non-corrosive surface which is said to greatly prolong can life. Cost of this treatment is about three dollars per ice can.—H. P. Hayes.

Water De-Mineralizers For Ice Making From Hard Water

QUESTION NO. 1164: A friend of mine who attended the Southwestern Ice Manufacturers' Association meeting in Texas last year told me he learned of a process for making ice from hard water by using a de-mineralizer. What is a de-mineralizer and how does it work?—W.R.B., Los Angeles.

ANSWER: De-mineralization is merely another term for water treatment. Clear, soft water is desirable for the production of clear ice. Solid particles such as mud and silt are removed by filtration. Odors are removed by aeration of the water or by treatment with activated carbon. Salts (hardness) are removed by some form of chemical treatment or de-mineralization. For a practical account of water treatment for ice making, see "Water Treatment Problems of the Refrigerating Engineer", by K. M. Holaday, in the 1954 NAPRE Operating Data Book.

The particular process to which your question refers is one which has been applied in Dallas, Texas. In the summer of 1956, a drought forced the people of Dallas to get their water supply from the Red River. This water has about 90 to 100 grams of sulphate and salts per gallon of water. In order to get clear ice, it was necessary to "de-mineralize" the water by chemical treatment. Actually, Zeolite softening can properly be called de-mineralization.—H. P. Hayes.

Determining Need For And Points From Which To Purge

QUESTION NO. 1165: How can we tell if we have air and non-condensible gases in a system in which there is no automatic purger and on which the head pressure does not seem excessive? What is the best point or points to purge these gases from the system?—J.B.S., Green Bay.

ANSWER: One way of checking for non-condensables is to shut down the refrigeration system except for the cooling water flowing through the condenser. When the refrigerant in the condenser has had sufficient time to cool to the water temperature, read the condenser pressure. Then check the refrigerant tables to determine the saturation pressure corresponding to the refrigerant temperature. If the gage pressure exceeds that read from the tables, non-condensables are in the system.

Purge the system at those points where non-condensables are most apt to occur. These points, of course, vary with the system. For example, with evaporative condensers (where the refrigerant gas velocity through the coil is usually high) the non-condensable gases are pushed down into the receiver. In such cases purge from the top of the receiver. As another example, in a long horizontal condenser with the gas inlet at the center of the shell, the non-condensables will tend to accumulate at the extreme ends of the shell. In this instance purge from the top, extreme ends of the condenser.—H. P. Hayes.

Economic Considerations For Vacuum Cooling Application

QUESTION NO. 1166: I have followed with great interest the development of vacuum cooling in the United States. I now have three questions:

1. What do you consider the minimum tonnage of produce required during the season to make vacuum cooling an economically sound procedure?

2. What would be the approximate cost of constructing a vacuum cooling unit?

3. In this area we have a considerable number of fruit cold storages which are now operating to full capacity. This means that a surplus of refrigeration is available, would you consider, therefore, that the vacuum pump plus refrigeration method would be most suitable?—S.W.P., Summerland, B. C., Canada.

ANSWER: Specific answers to your questions cannot be given because of the large number of variables. I am forced to answer in generalities.

1. A number of vacuum cooling plants use three vacuum chambers, each holding one one-half car of produce. Depending upon the material handling system and other factors, you can think in terms of one car per hour per tube. Using the system of vacuum pump plus refrigeration, this requires about 250 tons of refrigeration.

2. Because of the variety of designs possible, it is very difficult to give any cost data even on the rule-of-thumb basis. You can choose from

(a) Plants in which the vacuum chambers are so large that they hold a loaded refrigerator car or plants as small as one-fourth car per tube;

(b) Cooling systems which include steam jet refrigeration, vacuum pump plus mechanical refrigeration, or vacuum pump plus ice packed condensers; and,

(c) Material handling systems which vary from nearly complete automation to methods involving high labor costs but a minimum of initial investment.

3. The vacuum pump plus mechanical refrigeration system would be a wise choice in your case. However, do not overlook the ice-packed condenser as a possibility. One of the large ice companies in California is using this method very effectively.—H. P. Hayes.

New Questions

Water Temperature Control For Defrost and Condensing

QUESTION NO. 1167: Suggestions are welcome on how to raise temperature of the water used for defrosting in an automatic plant. In winter time high side pressure drops to 65 psi (ammonia plant) and in warmer weather the most head pressure is 110 psi. Condensing and defrosting water source is a cold spring. Water leaves the condenser so cold that getting evaporative units to defrost is difficult.—C. P., Yakima.

Transistor Functions

QUESTION NO. 1168: Transistors don't have much to do with refrigeration, but what are they and what do they do?—FLB, St. Louis.

Add to Compressor Capacity By Doubling RPM?

QUESTION NO. 1169: Theoretically, if speed of a 4 x 4 in., 900 rpm, compressor is doubled by changing pulleys, will capacity double? JERK, Chicago.

Analog On Heat Load Problem

QUESTION NO. 1170: Professional trade journals refer to analog methods of calculating heat loads. What is an analog? How can it be used to determine heat gain?—HDB, Milwaukee.

Immersion Shrimp Freezing

QUESTION NO. 1171: A client of ours has installed an ammonia freezing plant to handle shrimp tails. He has made an attempt to determine what solution should be used in his immersion tank but has met with no success. Can you offer any advice as to what solution to use?—HJT, Brisbane, Australia.

Basic Differences Between Single & Polyphase Motors

QUESTION NO. 1172: Explain basic differences between a single-phase and three-phase electric motor. Why does a single phase motor need a special starting capacitor? What happens to a three-phase motor if one phase open circuits when the motor is running?—A.W., Indianapolis.

News Notes and Chapter Activities

Refrigeration Applications in Mexico, Hawaii Described at Los Angeles Meeting

Los Angeles—Refrigeration systems in Mexico and Hawaii were described at the February 6 meeting of Los Angeles Chapter, NAPRE, by Lake Swisher, Powers Refrigeration, Los Angeles. Dairy, brewery and cold storage operations topped the various applications described by the speaker. A practical refrigeration engineer who has built and operated plants in the United States, Mexico and the Islands, Swisher vested his talk with the authority that stemmed from the fact that he was discussing plants that he himself had designed and installed.

Since his more recent activities were concerned with Hawaiian installations, he touched only briefly on Mexican refrigeration, describing one dairy plant. This, his listeners learned, was as modern as any in the United States. The building is of steel frame and cement block construction, the interior of white ceramic tile on the walls and red tile floors.

Refrigeration for the plant consists of a 2-stage system. First stage compression is a piston type booster compressor; the second stage of three compressors, with intercooler. Two evaporative condensers are used for liquefying the compressed gases. Impulse pump type blower coils are installed in the hardening and holding rooms. The processing room is completely air-conditioned and is equipped with the latest machinery for ice cream and cheese making, and milk handling.

Hawaiian Projects

Swisher devoted the major part of his assigned speaking time to describing four refrigeration plants in Hawaii for which he supervised the installation. He had spent the last 18 months in the Islands as representative of Powers Refrigeration. Projects No. 1 and 2 concerned the modernization, redesigning and installation of new refrigeration and cooling systems in the brewery plant, fruit and meat cold storage rooms of the Hawaii Brewing Company, Honolulu. Swisher referred to this project as the largest refrigeration system installed in the Islands in recent years.

Initial phase, before the new equipment could be installed, Swisher explained, involved the dismantling of two large diesel engine-driven compressors which had grown old from long use, and, expectantly, too expensive to operate. A new engine room space was created by rebuilding and remodeling the existing structure while removal of the old compressors and engines was underway.

The plant's electric wiring had to be completely revamped and a change of voltage made; new transformers were in-

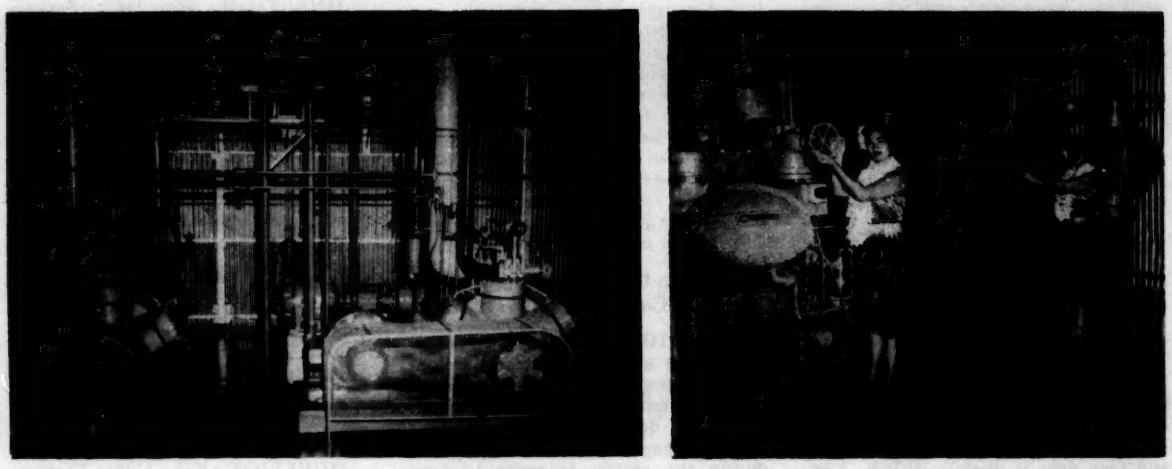

Fig. 1 — Size of the compressors pictured above, is difficult to judge until the viewer realizes that the same compressors appear in the illustration at the right. Machines in the foreground provide high-stage compression while rotaries serve as boosters. Plant is owned by Hawaii Brewing Co.

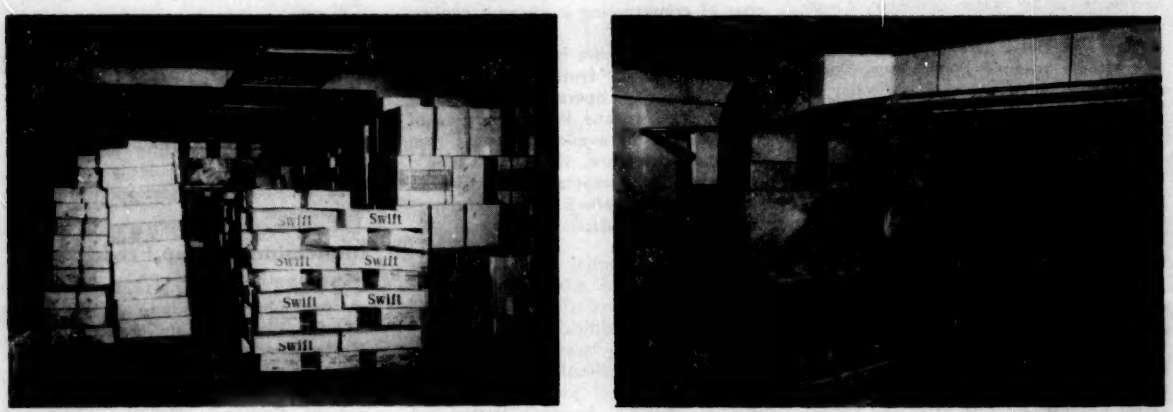

Fig. 2 — View at left shows palletized operation of Storage Div., Hawaii Brewing Co., while close-up at right shows blower coil arrangement and duct work. Powers Refrigeration of Los Angeles were contractors for extensive alterations and improvements.

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as provide contacts with prospects for industrial membership.

and in INDUSTRIAL REFRIGERATION entitled "Evaporator Coil Design". Daly had pre-

forming the chapter and the status of different types of members. Also brought

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Fig. 3 — At left are two Rotovane booster compressors, at right three 12-cylinder Carrier high-stage units, and below the distribution board and automatic control devices for the Hawaiian Dairymen's Ass'n. refrigerating plant.

stalled, disconnect switches, and a new gauge and control panel mounted, ready for the changeover. After this preliminary work was finished, the new refrigeration machinery was installed. This consisted of two Rotovane compressors for the first stage, and two six-cylinder Carrier compressors for the second stage (see Fig. 1).

"While this work was going on," Swisher said, "we were able to squeeze by, by curtailing some quick freezing operations at the storage plant and holding temperatures with one 500 hp synchronous motor-driven 4-cylinder compressor." He noted the periodic fluctuation of heat load caused by the brewery demand. Hot wort passing over the brine-cooled Baudelot cooler throws about 50 tons of refrigeration onto the system at once. In order to more adequately handle this load a two-speed motor was applied to one of the Rotovane compressors, and three-step capacity control provided in one of the reciprocating machines.

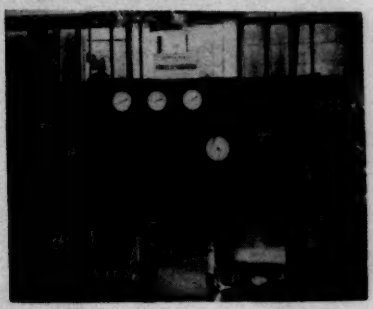
Swisher described the Hawaii Brewery plant installation as completely automatic, even to a change from hand-fired to automatic package type boilers. The scope of the project can be gauged from changes previously mentioned here, and the following: Completely new freezing tunnels; new insulation and evaporating surface in the rooms of the storage division (Fig. 2); new carbon dioxide collection system and compressor for fermentation control, carbonation and bottling operations; automatic controls, thermostats, gauges, and thermometers; new transformers (11,000 to 440 volts); and, new capacitator hook-up for power factor correction when the synchronous motor is shut down.

Operational Gains Derived

After work described had been completed, it was indicated that operating costs were cut nearly $5000 per month, without laying off one employee. Production in the freezing tunnel was increased and the quality of the brew was improved, which resulted in a larger volume of beer sales.

Dairy Association Plant

In addition to the brewery installation Swisher described the Dairymen's Association of Hawaii as Project No. 3, which, he said, required practically the same procedure and schedule. New equipment consisted of the following: Two Rotovane



booster compressors, three 12-cylinder Carrier high-stage compressors, two Carrier evaporative condensers, three new transformers (11,000 to 220 volts), and an all-new power panel. This job involved a complete change-over from hand operated single-stage to completely automatic two-stage operation. The work had to be done, the speaker explained, without interrupting the operation of the plant. To accomplish that, many temporary pipe connections were used.

In conclusion, Swisher described briefly a plant in Hilo on the island of Hawaii. This job also involved changing the system from single-stage to two-stage automatic operation, and included the installation of a booster compressor, evaporative condenser, purge drum, oil separator, gas precooler, piping and covering. Felix W. Powers, president, Powers Refrigeration, and Roland Kohler of the quality controls laboratories, Beatrice Foods Co., Chicago, who spent considerable time in Hawaii with Swisher, collaborated with the speaker in answering questions following the talk.

Kohler rounded out the February 6 program by presenting three reels of colored travel films which he took in Hawaii, including some startling dramatic views of Kilaua volcano in eruption in 1951 and 1955.

Business Relations Plans

Larry H. Benedict, national chairman, Industry Relations Committee, announced that Hal Jarvis of the Recold Corp. had accepted the chairmanship of the Los Angeles Chapter public relations and industrial membership committee. To spur the drive for Industrial Members, Benedict and Jarvis reported that a plan had been worked out which should increase attendance at the semi-monthly meetings as well

intendent Engineer for Sick's Enterprises. McCorkle and Penor are his chief engi-

by emergency electric service is provided by a Diesel engine generator which the

pumps, fire pumps, water service, water tower, ventilating systems, and Vogt Tube-

as provide contacts with prospects for industrial membership.

The plan calls for a special letter of invitation to be sent to men working in certain industries when a technical talk dealing with their industry is scheduled at an NAPRE meeting. Thus, when refrigeration in a dairy plant or hotel is scheduled, letters will go out to men working in such establishments calling the program to their attention.

Guy R. King, Educational Chairman, reported on an air conditioning, heating, ventilating and refrigeration exhibit and conference which is to be held in Shrine Auditorium, Los Angeles, May 4 to 8. Los Angeles Chapter, NAPRE, is invited to participate by providing lecturers for one of the sessions which will be devoted to practical plant refrigeration.—FRED HERR.

Inland Cold Storage Plant Sunflower Chapter Topic

KANSAS CITY—Interruptions by unexpected visitors are usually not tolerated in most NAPRE Chapters, but the Greater Kansas City Chapter enjoyed some very interesting and welcome guests who surprised the January 15 meeting by their impromptu appearance. The visitors were John F. Daly, retired, formerly manager, and J. J. Korinek, engineer, Santa Fe Railway Company Ice Plants. Both gentlemen are active members of California Chapter No. 2.

Daly and Korinek were in the Kansas City area working on some proposed plant expansions at the Inland Cold Storage Company. Having designed this plant and supervised its construction, they were able to give the members present some very interesting details and sidelights of its design, construction and operation.

Instruction period for the evening was devoted to Chapter 5, Evaporators. There was some discussion of the purpose, good design, characteristics and requirements for a good evaporator and then the discussion turned to the many and various types of evaporators. During this discussion Mr. Daly described and demonstrated several types of coil designs that he and his people had worked on throughout the year.

President Kenagy refreshed the memories of many members present by pointing out an article that appeared in both the NAPRE Operating Data Book in 1953 and in INDUSTRIAL REFRIGERATION entitled "Evaporator Coil Design". Daly had presented his paper at the 1951 NAPRE Convention at Dallas.—J. G. MULLER.

Bakersfield Engineer Unit Requests NAPRE Charter

Kern County, California—First official act of an engineering group at Bakersfield, California, toward complying with qualifications for a charter from NAPRE was a meeting of refrigerating personnel on February 26. The meeting was held in the Hostess Room, Carnation Co. plant, and attended by the ten active NAPRE member-petitioners, three California Chapter No. 2 guests, and nine prospective members.

President pro-tem W. R. Greenstreet, Manager, Santa Fe Ice Plant, called the meeting to order. Each man introduced himself in accord with NAPRE custom. Greenstreet, until now a member of Stockton-Modesto Chapter, introduced the three guests, well known Los Angeles members, V. A. Stubblefield, Regis Gubser, and W. H. Britten. The guests proved to be participants in the evening program.

First speaker was Gubser on the service and benefits offered by NAPRE to the industry, the problems faced in forming a new chapter and how to cope with them. Gubser, as past national president, and past chapter prexy as well, left many valuable tips on organization work and showed how the Association helps an individual. Gubser is now vice-president for engineering at California Consumers Corp.

Next speaker was Stubblefield, President of California Chapter No. 2, with a welcome address, an explanation of the duties of chapter officers, and procedures for conducting meetings. "Stubby" is plant manager at Los Angeles for Pacific Fruit Express Co.

Third speaker was Britten whose topic concerned the early days of NAPRE and how it had grown. He related some of his personal experiences and left his recommendations for active participation in chapter activities. Britten is now with the Engineering Department, of the City of San Clemente.

Fourth address of the evening was by Secretary-Treasurer (pro-tem) Leon Stanfield. He concluded with a run down on preliminary work accomplished and official correspondence to date. Following the speakers was a general discussion on forming the chapter and the status of different types of members. Also brought up were the problems of the best night on which to meet and a permanent meeting hall site. Refreshments furnished following the meeting were by courtesy of Carnation Co.—LEON STANFIELD.

Seattle & Yakima Speakers Help New Washington Group

SPOKANE—Another NAPRE Chapter became a reality on February 25, with the cooperation of management and labor in the Spokane, Washington, area. A meeting was arranged with the members of IUOE Local No. 83, Spokane, who were interested in the formation of an NAPRE chapter. M. E. Bell of Seattle, accompanied by Bill McCorkle, Bob Harrison and Howard Penor, also of Seattle, and Howard Peterson and Elmer Toop of Yakima, were on hand to introduce the organization. The meeting was held at Sick's Spokane Brewery's guest room where luncheon and refreshments were served. It was called to order by M. E. Bell, a National Director of NAPRE, who covered the highlights and purposes of the Association.

A presiding officer was elected to take charge of the meeting and a secretary was elected to take the minutes. Further election of officers continued as follows: Secretary-Treasurer, W. G. Erickson; President, Dick Quam; 1st Vice-President, Clifford H. Clapp; 2nd Vice-President, August Mansfield; Sgt.-at-Arms, Robert Brandvolt.

Indoctrination of officers in their duties was performed by NAPRE Past National President Howard H. Peterson. Then applications were passed out by the Sgt.-at-Arms. It was decided that this chapter would be called Spokane Chapter, NAPRE. It was then decided that two meetings a month would be held; the first Monday and third Thursday of every month, to be held at Engineers Hall, 325 S. Brown, at 7:00 p.m.

Bob Harrison, Chapter Instructor, at Seattle, Mechanical Engineer for Boeing Aircraft Co., gave a short talk on refrigeration and the highlights of some phases that would be covered in the educational program. Members expressed their appreciation to the two chapters, Seattle & Yakima, for their assistance, and to the parties individually as well. Bell is Super-

Greater Kansas City Chapter NAPRE held its installation of officers at a dinner affair in January. Pictured at left are the ladies who attended, and at right the members.

Shippers Precooling Service Finds NAPRE An Asset

ing months the equipment goes very much migratory, carrying the operators through-

intendent Engineer for Sick's Enterprises. McCorkle and Penor are his chief engineers at the two Seattle plants and past presidents of Washington Chapter No. 1 in that City. Peterson is a consulting engineer at Yakima, and Toop, the NAPRE Chapter President there, is on his own as a refrigeration service engineer.—W. G.

Apple Country Engineers Study Recirculating Systems

YAKIMA—Ammonia Recirculating and Liquid Return Systems was the topic of the discussion which followed an inspection trip at Warren and Co. by members of the Yakima Chapter on January 9. Luther Stewart is engineer at this plant, which employs a recirculating system.

The booklet published by Nickerson & Collins Co. and written by Professor W. F. Stoecker, University of Illinois, which was circulated free of charge to all NAPRE members in 1956, inspired this trip and discussion. The recirculating system in Stewart's plant is the type which employs a liquid ammonia pump rather than a valved gas-pressure pumping type.

Officers Re-elected

Yakima Chapter unanimously re-elected the officers who had led the chapter in 1956. They are Elmer A. Toop, president and financial secretary; Arthur L. Krum, vice-president; Galen Sutton, recording secretary; E. A. Wahlstrom, sgt.-at-arms. Kenneth Otteman was appointed the new chapter instructor.

Safety was the principal topic of the second January meeting held on the 23rd. The discussion brought out one fact that the engineer is being employed in work away from the engine room more and more. As a result greater emphasis must be placed on built-in safety devices for machinery piping and equipment.—Elmer Toop.

Henry Ford Hospital Toured By Bright NAPRE Group

DETROIT—Power and Engine Room facilities of the Henry Ford Hospital were opened to inspection and examination by the George B. Bright Chapter, NAPRE, (formerly Michigan Chapter No. 1) on January 24. This tour was held in place of their regular chapter meeting. Members motored to the site, parked on the grounds and met in the hospital auditorium located in the clinic building.

Personnel Director George Delaney of the Ford Hospital welcomed the members and Leonard Bedard, president of the George B. Bright Chapter and chief engineer of the hospital described the facilities.

High Pressure Boilers

Among the items of interest which the members and their guests saw, included high pressure boilers operating under modern automatic controls. Members were quite startled to learn that these boilers are capable of being placed on a line in five minutes time from a cold store. Standby emergency electric service is provided by a Diesel engine generator which the members also inspected.

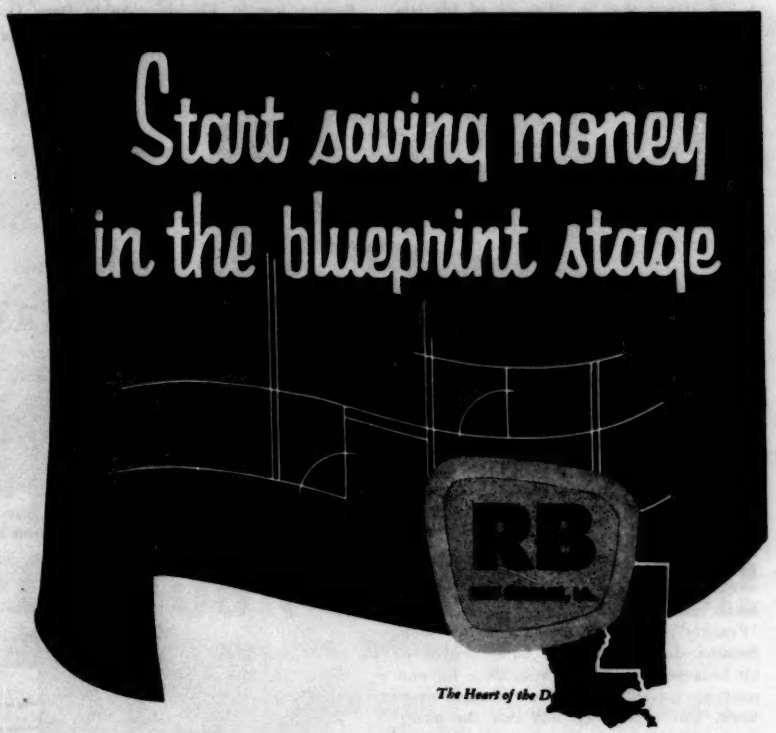
Data and Control Center

Of principal interest to Ford tourists of this particular meeting was the supervisory data system installed in the engineer's office. This apparatus provides constant supervision over 85 critical services or pieces of equipment. It includes visible and audible signals, recording and controlling devices which regulate a number of the systems within the plant.

Other equipment inspected included two 900 hp Carrier centrifugal refrigeration units with variable speed motors; house pumps, fire pumps, water service, water tower, ventilating systems, and Vogt Tube-Ice Machine, which makes five tons of ice cubes in 24 hours.

Many of the visitors considered the non-lubricated Ingersoll Rand air compressor to be unique. This unit supplies compressed air throughout the hospital. It is of the non-lubricate cylinder type so that all air supplied for hospital service is not contaminated with oil. —Leo Gage.

(Editorial Note: This report from the Detroit scribe was in much greater detail and accompanied by pictures. It will be published as a feature rather than a complete chapter report. Watch for it in an early issue.)



WHILE IT'S ON THE DRAWING BOARD is the time to start saving money on your new cold storage facility. Here is where the efficiency—the operating costs—of your plant are really determined. What types of insulation, what installation techniques, what operational problems must be headed off? These and many others are questions you can answer with confidence when a REILLY-BENTON insulation specialist sits in on the planning stages.

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Precooling Methods Described

There are two general types of precool-

Texas Engineer Dean Ranks

with the Tennessee Valley Authority and what wonders it has done for the coun-

Shippers Precooling Service Finds NAPRE An Asset

LAKELAND, FLORIDA — Among NAPRE Members-at-large who would like to have an opportunity to participate to a greater extent in chapter activities is Walter M. Galloway, General Manager of the Shippers Precooling Service at Lakeland, Florida. Galloway explains that their particular service takes personnel who are NAPRE members on assignments many miles from the NAPRE chapters, mostly on seasonal work which makes it highly impractical for the member to attend any planned refrigeration course instruction (See Fig. 1).

In his correspondence to the National Vice-President and our headquarters, Galloway stated that in 1956 six of his employees were registered through the Tampa Chapter. They attended a number of weekly night sessions hoping to become better trained in Basic Refrigeration. "Frankly", Galloway explained, "we soon became discouraged and had to give it up because it was quite a sacrifice for our men to travel at night to Tampa each week. Our experience was that the meetings served the purpose for the local chapter members who could attend regularly. Our men never did get past the first few chapters due to their absences and when they did return, many of the technical discussions were of no benefit to them at that stage of their return. A regular home study course would be of more benefit to members-at-large."

Mobile Equipment Described

This member who first became acquainted with NAPRE in Texas, described their operations. The Shippers Precooling Service operates a fleet of 20 mobile mechanical refrigeration systems. Sixteen of the units consist of 40-ton Carrier equipment (See Fig. 2), and four of them are 30-ton Chrysler units, (See Fig. 3), all mounted on cab-over-engine trucks. They are used for removal of heat and excess surface moisture from perishable fruits and vegetables at shipping point, usually upon completion of loading into a railroad car or insulated truck trailer.

Operations of Shippers Precooling Service are in Florida roughly from October through June. During the remaining months the equipment goes very much migratory, carrying the operators throughout the South, Midwest and Northwest. As Galloway explained, the units go where the product is rather than have the product come to them.

The firm has been in business since 1937 having started in Brownsville, Texas, where Galloway became an NAPRE member-at-large in 1951. The firm moved to Lakeland, Florida in the Fall of 1951 after a freeze in the Valley destroyed the Texas citrus crop and changes were made in production of certain vegetables which they had previously precooled. According to Galloway these changes were primarily due to drought and labor situations.

The move from Texas to Florida caused the demand for precooling services of this firm to increase. The firm moved to Florida with 10 units, now have 20, and have just purchased three more. The plans are to expand the number of truck units even further.

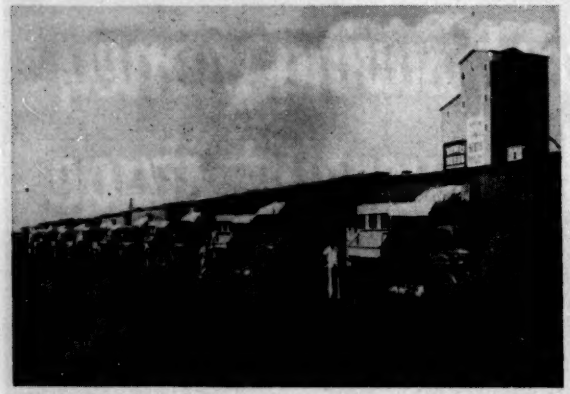

Fig. 1 — Eight mobile precooling units in service at a Southern produce area. NAPRE members operating this fleet find little opportunity for chapter activities, but are quick to affirm other benefits of membership.

Fig. 2 — Close-up of the 40-ton unit in operation. Internal combustion engine drives compressor and blower unit.

Fig. 3 — Precooling service for insulated or refrigerated semi-trailers is provided in the field by this 30-ton Mobile refrigerating plant.

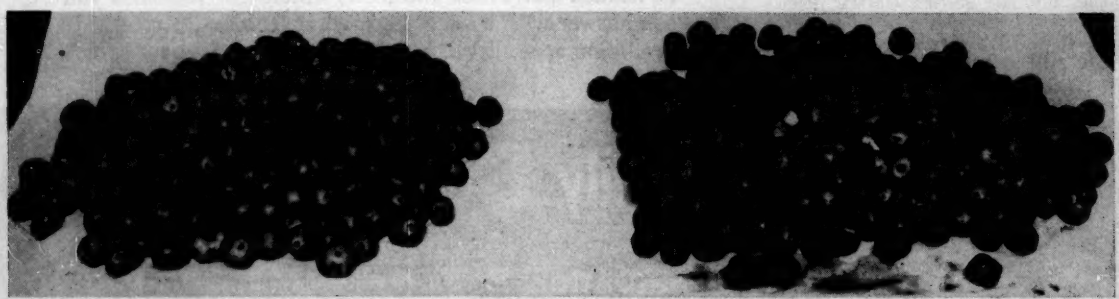

Fig. 4 — Comparison of precooling product with those which are not precooled. Potatoes on the left were air-conditioned initially by Shippers Precooling Service. The potatoes on the right had ample ventilation but were not precooled. Both experienced the same packing and shipping conditions.

Precooling Methods Described

There are two general types of precooling used by industry other than Shippers Precooling service; hydro-cooling and vacuum cooling. Galloway stated that there is a place for each and so long as the customer understands each application, all types do the job properly. All types he believes render a definite service to the industry through protection of the commodity and ultimately provide extention of shelf or storage life. When asked whether there was any conflict between the types of precooling service, Galloway stated, "There has been no conflict between our service and these other types to date in the areas where we have consistently worked during our years in the business. We don't anticipate any such conflict".

"We members here at Shippers Precooling Service would certainly like to become better acquainted with NAPRE and take more advantage of the benefits offered. We have problems which we are certain that your group could assist us to straighten out. The firm is getting along all right with increasing demand for our service, but with more than a little professional pride in our ability as refrigerating engineers, we could likely do a much better job more efficiently, from the operational standpoint." Galloway continued, "We surely hope that a number of us can attend the convention in November, so keep us posted and we will try to lay our plans in that direction."

Tribute to USDA

In his communication, Galloway paid tribute to the U.S. Department of Agriculture. "We work closely with USDA men, scientists, who are dedicated to the task of probing into the causes of deterioration of perishables of all kinds, from the production, harvesting, packing, transportation and destination handling of these commodities. So much valuable information has been compiled by them through the years, and right up to date, keeping themselves and the industry informed as to best means of providing that necessary protection (See Fig. 4).

"Unfortunately, we find that the industry, as a whole, pays little attention to this mass of information put out for their own good. They're 'too busy', and follow the line of least resistance. We are confident NAPRE has found this true in segments of the refrigerating industry. So long as engineers and management 'get by' they make no change. It is our aim here at Shippers to learn all we can through this government department just as we do through NAPRE. Then we disseminate it as thoroughly as possible — always to the advantage of the growing, shipping and buying public."

Correction

This column erroneously reported the name of an associate to NAPRE's good member, N. S. Chadha of Agra, U. P., India. On page 40, Sept. 1956, we indicated Shia B. R. Machetna was collaborating on a book with Chadha. The party named should have been Mr. B. R. Malhorta. NAPRE expresses its regrets for the error. — Roy T. Burns, Vice-President.

Texas Engineer Dean Ranks Our Field Nation's Seventh

MEMPHIS—Tennessee Chapter No. 1 was honored by the attendance of Dean W. R. Woolrich, Engineering College, University of Texas, at the chapter meeting on February 6. The Dean told the members and guests about his travels in foreign countries for the U.S. Government in refrigeration research. He related how far behind they are in refrigeration in those countries compared with the U.S.A. He said some countries were ahead of others, but as a whole they are many years behind.

Woolrich also explained about his work with the Tennessee Valley Authority and what wonders it has done for the country, especially in flood control. He urged the young engineer to avail himself of every opportunity to get ahead in refrigeration as *it is the seventh largest industry today and growing fast.*

At the second monthly meeting, February 20, President J. H. Robinson, in the absence of Instructor H. L. Todd, held an open forum on Chapter 4 (Function of Expansion Valves). He had several cutaway types of expansion valves that the group could study, used the black board to explain his talk and had the group answer the questions following the text.

The motion picture titled "And Then

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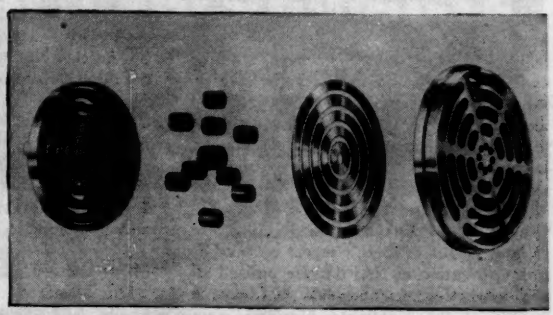

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There Were Four" was shown as entertainment for this NAPRE meeting, but it turned out, not only to be entertaining, but brought home a lesson that we all must learn. The suspense is tremendous, though the picture was made in the late '40's and was narrated by Jimmy Stewart. It made even our rough and tough engineers feel guilty and you could denote a slight lump in their throats.

This picture is a must for other chapter meetings. It makes us ashamed of ourselves for what we let happen on our city streets and the danger to which we subject our fellow citizens and neighbors with our own automobiles through chance driving. All learned a great lesson that some will forget too soon. The picture is available through the Modern Picture Service throughout the country and was produced by Socony Oil Company, Inc.—CHAS. CONLEY.....

Texans Ride Out Drought; Valley Group Hear Doneis'

PHARR, TEXAS—Rio Grande Valley chapter has been laboring under difficulties which seemed to threaten its very existence. The severe drought conditions which have prevailed in south Texas has prevented even a partial harvest of the usual abundance, and ice plants have been lying idle. Personnel has been shuffled and transferred, and some layoffs have resulted too. The resulting uncertainty and disruption of routine has militated against regular and enthusiastic participation of chapter meetings.

On January 8, however, a few of the "spark-plugs" and old-faithfuls of the Rio Grande Valley Chapter gathered together to hear Angus Casberg's report on the Detroit Convention of NAPRE. He praised all the convention arrangements and gave a resume of the highlights. Members were particularly interested in his report on an automatic ice plant with large centrifugal compressors and they gathered around the drawings which he exhibited, and on which he pointed out the salient features.

On January 15, a more representative gathering of the faithful met for an informal discussion and question period dealing with maintenance of compressor valves and outboard bearings. Armin Doneis had brought some discharge valves for scrutiny and inspection, and each member contributed some helpful comment on how best to test, regrind or recondition various types of valves.

At other meeting nights the chapter has had rump sessions during which the officers discussed operational and maintenance problems relating to the vacuum-chill retorts which members operate here for quick chilling of head lettuce. There are three of these establishments in the Rio Grande Valley with a total of six retorts. These have helped materially in assuring revenue and continue operation for ice-plants which might otherwise have had to trim their sails because of the effects of the drought on the vegetable harvest, and resultant lack of ice sales.

Ladies' Night

On March 5, the chapter celebrated Ladies' Night at which the members' wives were honored guests. They also graciously and generously contributed toward the success of the party with tasty examples of their culinary arts. After a delicious covered-dish supper with ample portions and seconds, and a pleasant hour of fellowship and visiting, the tables were cleared and everybody was in a mood for some entertainment.

The Armin Doneis Family proceeded to share with the gathering some of the highlights of their four-months travel through 14 European countries. They told about their 10,000 miles of vagabonding and "rubbernecking" on the continent. They showed about 200 choice colored slides on the screen which were much admired. A total of 700 colored and 700 black-&-white pictures were taken enroute.

A running commentary by Mary Doneis, with assists and aides by other members of the family accompanied the showing of the pictures in which the joys and trials encountered, when an entire family of five travels abroad, were described. She described the warm hospitality which her family enjoyed in the homes and societies of the Esperantists in Europe, and explained what a tremendous difference it makes to travel with the help of the International Language, Esperanto. She told of being honored guests at 41 private homes in 14 countries where Esperanto was the very satisfactory and successful means of communication, and how her family got to know the natives as intimate friends.

Attend Esperanto Congress

Mrs. Doneis described the unique experience which her family enjoyed at the 41st Annual Universal Esperanto Congress in Copenhagen, where they met 2200 people from 44 nations, and only one language was used. She also told of the many friendships established during that week, and how those friendships are being perpetuated through Esperanto correspondence across the seas since their return home.

Marv Doneis said "It's no secret that our money would have gone much faster, and we'd have had to cut our stay in half, if it had not been for the many economies that were made possible through the use of Esperanto". She explained that Esperantists are predominantly idealists who are particularly interested in fostering good will and international understanding, and that they are therefore unusually alert to every opportunity for meeting foreign travelers, making them welcome in their homes and societies, and in demonstrating the great practical value of Esperanto in everyday affairs, as well as facilitating international understanding.

At this point, Armin was called on to report on refrigeration applications which he may have observed. He related that he had no contact with refrigeration plants over there; hardly saw any even from the road. "Frankly, I don't believe they use much refrigeration except for holding fish on shipboard. One thing that amazed me over there was the almost complete lack of electric welding. Here every other farmer has some sort of welding outfit if his operations are large. Garages and shops are all equipped here with gas and electric welding. Over there I saw electric welding used only on major construction jobs like bridges and towers, and in large scale production of machinery, like automobile factories and electrical manufacturing plants."

Some surprise was expressed that Armin is not only a conscientious ice-maker and valve-twister and NAPRE worker, but that he also has a very wide field of other interests covering such subjects as photography, Esperanto, electronics and foreign relations.—BARNEY MAJESKY.

The Armin F. Doneis family enroute to Europe in 1956. This former officer of the Rio Grande Valley Chapter related their experiences at a recent meeting.

Wisconsin NAPRE Hosts Mid West Regional Meeting

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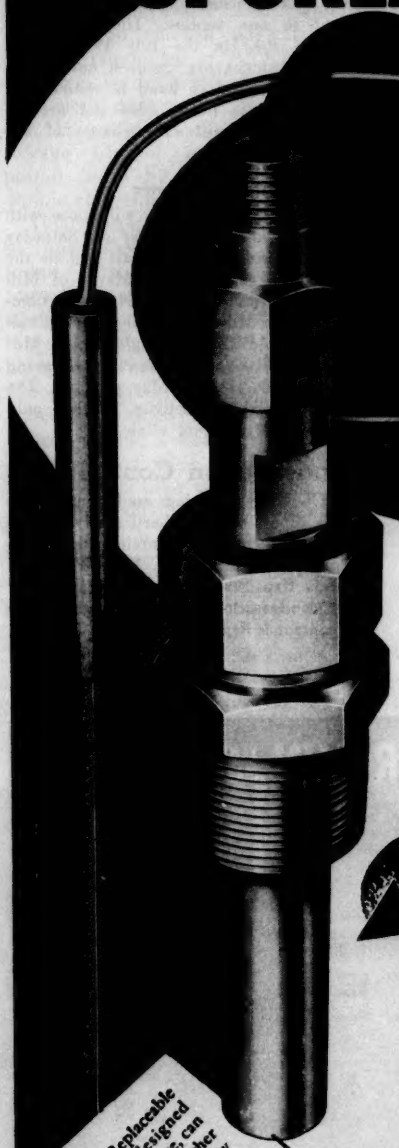

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Wisconsin NAPRE Hosts Mid-West Regional Meeting

MILWAUKEE—Regional Conferences among NAPRE chapters this Spring will be lead by the Mid-West meeting at Milwaukee on April 26, 27 and 28. The affair, which will headquarter at the Plankinton Hotel, Milwaukee, includes four plant tours, four technical presentations, a chapter problem clinic and a social. Ladies are not forgotten, a special program having been arranged for them.

Opening on Friday, April 26, the Conference schedules registration from noon on. At 2:00 p.m. the first of the four tours takes place. The Vilter Manufacturing Co. has opened its doors to NAPRE for a visit to the manufacturing facilities where equipment machining and assembling operations can be witnessed.

Miller Brewing Co. will be host that evening at 6:30 p.m. Itenerary for that visit includes a tour of the refrigerating machinery plant (a treat seldom enjoyed by other visitors), a buffet and social period, and concluding with color movies. Advance registration (by mail, to Milwaukee Chapter Secretary) is required for both Friday events.

Saturday Program

Conference schedule for Saturday, April 27, opens at 9:00 a.m. with the invocation and a welcome, following which the ladies and the members and male guests part company. First speaker for the technical session is Bob Crawford, Field Service Manager, Ideal Electric and Manufacturing Co., Mansfield, Ohio. Crawford's topic will be a practical presentation on the operation, service and maintenance of a synchronous motor as an "Electric Drive for Refrigeration Compressors".

Mid-morning speaker will be A. S. Schneider, Inspector Manager, Hartford Steam Boiler Inspection and Insurance Service, Chicago Office. Schnieder, with the firm that inspired NAPRE's current preventive series in *Industrial Refrigeration*, will have "Refrigeration Plant Maintenance As Seen From The Inspector's Viewpoint", as his topic.

Problems in refrigeration plant operation and upkeep will be tackled prior to the luncheon recess, by a panel of operating, erection and supervising engineers from Milwaukee, Green Bay and Chicago, among them NAPRE's National Director Eugene Rytlewski of City Products Corp. Following lunch, seminars on the morning talks and Question Box, will be held.

Two tours will be conducted Saturday afternoon. Although they will be held simultaneously, because of the close proximity of the two host plants, it is expected that touring groups will be able to "trade-off" about mid-afternoon. Home freezer manufacturing techniques at Ben-Hur Manufacturing Co. will probably appeal to the ladies as well as conference participants. This is the plant which has offered the 9 cu. ft. home freezer as 1957 National Convention attendance award.

The other tour will be of Luick Co. Div., Sealtest Dairies. This plant is newest in the region and has separate ice cream and milk processing establishments adjacent to one another. The milk plant was described in the July 1956, INDUSTRIAL REFRIGERATION. Sealtest and design engineers will be on hand to confer with members, while Luick sales and production personnel will take charge of the ladies.

Mayor to Address Dinner

Socially the conference will close with a cocktail hour and dinner on Saturday evening. Speaker at the affair will be the Honorable Frank Zeidler, Mayor of Milwaukee. Milwaukee's Association of Commerce and Milwaukee School of Engineering (NAPRE's meeting place in Milwaukee) will also be represented. Dancing will conclude the Saturday program. The Sunday, April 28, activity consists only of a breakfast chapter clinic.

Condensation Control

PROGRESS is being made on studies of vapor control, particularly as affected by surfaces of container walls and subsurface conditions. Dr. J. G. Woodroof, Georgia Exp. Station has observed that on cans, condensation continues longest when the content is densest.

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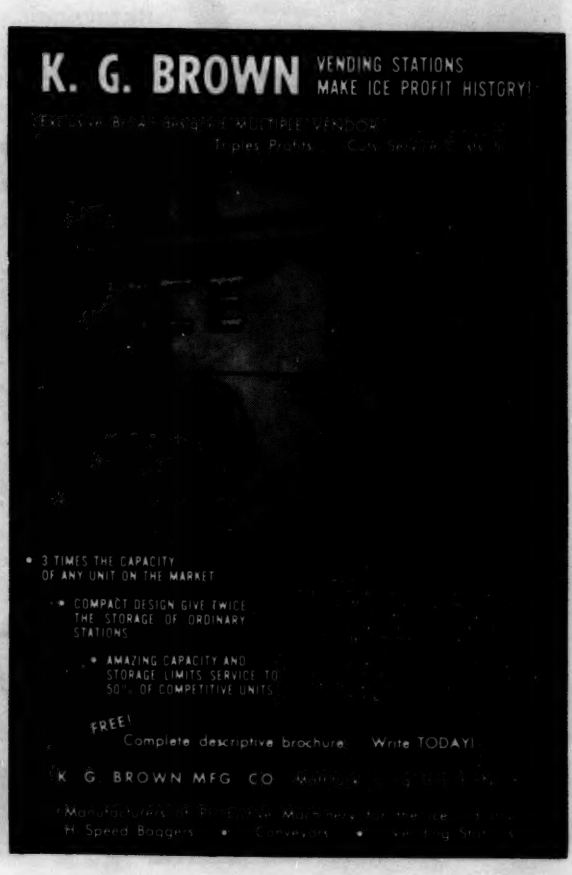
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Atomic Energy Adds Storage Life to Chickens

FRESH chickens, "pasteurized" by atomic radiation, might some day find a place on retail meat counters. Research on chicken pasteurization is being conducted at the University of Illinois by John McGill of the food technology department. McGill found that he could lengthen refrigerated storage life of eviscerated three-pound birds by exposing them to atomic radiation.

This pasteurization project began in June 1956, after other researchers found that "sterilizing" poultry caused loss of flavor and texture. The sterilization method made use of large amounts of radiation to kill all bacteria. The department's food processing group, of which McGill is a member, wanted to find what would happen if only a small amount of radiation was applied to get "pasteurization" rather than sterilization. They knew they couldn't kill all the micro-organisms but thought they might be able to destroy many of those that cause spoilage.

Here's how they went about the job: Fowl were taken off the dressing line of a commercial packing plant. They were packed in ice and trucked to the atomic radiation source, the "Phoenix Project" at the University of Michigan at Ann Arbor. Gamma rays from radioactive cobalt were shot into the chickens for about five hours. The poultry were then hauled back to the laboratory at Urbana-Champaign, where extensive tests on the effect of the radiation followed.

First the poultry were stored at different temperatures and for varying lengths of time. Then the birds were broiled without seasoning and tested by a panel of 10 experts for any changes that might have occurred in taste, smell, texture and color.

The results? McGill says that radiated chickens kept at 34 degrees were just as delicious as untreated ones even though they had been stored nine days longer, or almost twice as long as usual. And those stored at 40 degrees were good for about five days over the normal storage time.

This means that fresh pasteurized chickens could be shipped greater distances, thereby expanding the market, he explains. In addition, these unfrozen poultry could be shipped more cheaply than the frozen kind.

This method of prolonging the storage life of poultry can some day be used on the commercial level, the researcher adds. Processors would use the "spent fuel elements" from reactors in atomic power plants.

Storage of Bermuda Onions

A FIVE-YEAR summary of the TRRF aided project on Bermuda onions has been issued by B. W. Wilson and G. W. Adriance of Texas Agricultural Experiment Station. The report states that Texas ranks first in production of early and late spring onions, chiefly the Bermuda type. Wide price fluctuation during the rather short harvest season prompted the cold storage study, which has shown that when prices are depressed the onions can be safely stored for market betterment.

Here are some of the major conclusions: Cold store as soon as possible after harvest. Remove all culls. Be sure that cold-stored onions are dry. The 1954 data indicated that curing beyond six days is likely to produce excessive sprouting after removal from cold storage. Granex and Crystal Wax varieties remained in excellent shape for 17 weeks at 32 and 35 F with rhs of 50 and 75 percent. The two temperatures and two humidities produced no difference in effect. If held beyond 17 weeks in cold storage, onions should be moved rapidly into retail outlets to prevent losses from sprouting. Some rotting occured after 25 weeks but was not excessive until 29 weeks.—TRRF Bulletin.

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Truck-Trailer Makers Seek Information on Refrigeration

HOW fast and to what extent a truck trailer will absorb heat, was discussed by a special committee at the annual convention of the Truck-Trailer Manufacturers Association, January 19-23. The importance of the refrigerated trailer in the transportation of frozen foods creates a background for the work of this committee.

Results of a test made last May were reviewed. This test was made at Edgewater Gulf, Miss., to determine, with new trailers, using a reverse heat flow method; (1) how fast the trailers could be pulled down to zero; (2) refrigeration required to hold at that temperature, and (3) how fast they would warm up from the zero level with refrigeration cut off. Trailer makers supplied the trailers, and the tests were conducted by a team of technicians from the U. S. Department of Agriculture and the National Bureau of Standards. From this test it was reported that all trailers tested reached the objective of maintaining zero although parked in the hot Mississippi sun. At times the trailer roofs registered 135 F, while zero was maintained inside.

While the results of this test were very favorable, the trailer-truck manufacturers concede that they have not yet attained the ideal in supplying every frozen food transportation demand with the exact vehicle desired. This is because different frozen foods require different temperatures to keep best. The markets themselves sprawl out all over the country, some requiring short hauls and others hauls that run into thousands of miles. Moreover, latent heat of the foods, the number of times trailer doors are opened in transit, the type of refrigeration device, the weather and many other factors must be taken into consideration in vehicle design. This, of course, must be done at a price that fits the shipper and, ultimately the customer's purse.

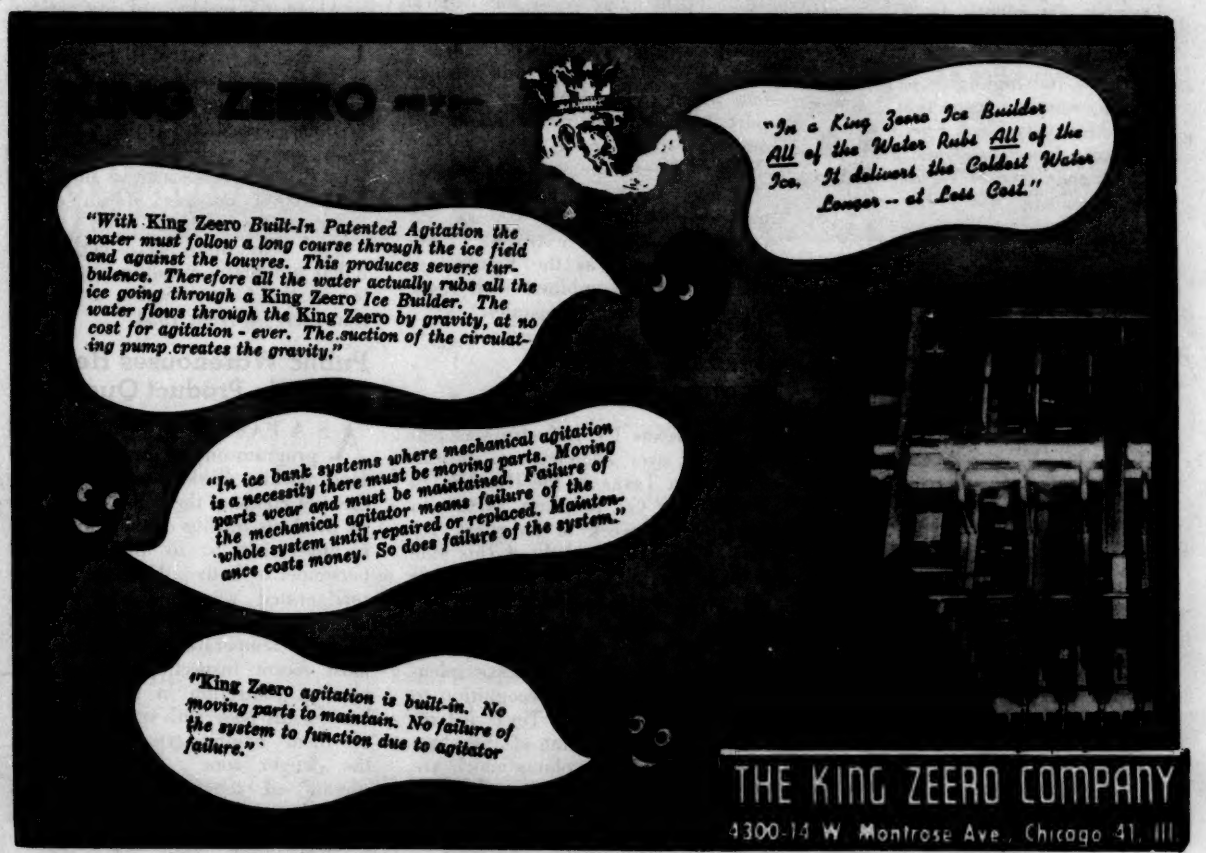
They also want to know what the performance is when the vehicle is moving, say at 50 miles per hour. They want to know whether the same results would show up in testing a trailer that has been in use for some time. They want to know about the effects of moisture gain in the insulation, and many other things.

What the trailer men desire is a method of uniform rating that will enable any manufacturer to deliver a trailer with a known rate of heat infiltration. The maker of the refrigerating device then can recommend, with confidence, a unit with sufficient capacity to handle the trailerload of frozen foods and still provide an adequate margin of refrigeration for safety in transit.

When the ideal is achieved, it is hoped that the frozen food industry will be able to bring the products to the tables of America in tip-top condition.

Frozen Milk Abroad

ACCORDING to recent press report, United Kingdom of Denmark has achieved success with frozen milk. The Danish product has been used aboard ships. In England, the Institute of Dairy Research has kept the frozen product in plastic bags and one corporation is considering commercial exploitation. The report does not state that the success achieved is any greater than has been achieved here. The problem remaining is the separation and settling of protein solids when milk is thawed.—TRRF Bulletin.


"With King Zeero Built-In Patented Agitation the water must follow a long course through the ice field and against the louvres. This produces severe turbulence. Therefore all the water actually rubs all the ice going through a King Zeero Ice Builder. The water flows through the King Zeero by gravity, at no cost for agitation - ever. The suction of the circulating pump creates the gravity."
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"King Zeero agitation is built-in. No moving parts to maintain. No failure of the system to function due to agitator failure."
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Ohio-Michigan-Indiana Second Joint Convention

FOR the second year the Ohio, Indiana and Michigan Associations held a joint annual convention at Detroit, Mich. In addition to these states, Icemen from Illinois, Wisconsin and Canada were invited to participate. The Industry was well represented from the entire area. The meeting was held at the Detroit-Leland Hotel, February 24 to 27.

Monday, February 25, a Great Lakes NAII Regional Conference was held. Eugene K. Wellman, NAII president of the Great Lakes Division, served as Chairman. Guy W. Jacobs, NAII Executive Secretary, addressed the meeting, and C. P. Austin moderated the Conference.

The business sessions of the Convention were panel meetings. Max Welch, President of the Indiana Association, served as moderator of the Tuesday panel. The panel members were: Henry L. Dithmer, Indianapolis; John McKellar, Detroit; George Heath, Madison, Wisconsin; John H. Glenn, Beardstown, Illinois; and Edward Dager of Bucyrus, Ohio.

The Wednesday panel was moderated by James S. Boardman, President of the Ohio Association. The panel members included J. M. Twomey, Cincinnati; George Steers, Kalamazoo, and G. P. Bush, Gallipolis, Ohio.

One of the highlights of the convention was an inspection tour of the Detroit City Ice & Fuel Company and Borin Brothers plants. This first-hand examination of various modern production and processing methods added materially to the down-to-earth business discussions.

The entertainment consisted of a gay cocktail party Sunday evening, an evening at Goebbel's Brewery, and a delightful dinner-dance and floor show at the famous Elmwood Casino in Windsor, Ontario, Canada.

The following officers were elected by their respective Associations:

Ohio Association

President: James S. Boardman, Columbus.
Vice-President: Edward Dager, Bucyrus.
Secretary-Treasurer: Elizabeth Sannon, Steubenville.

Indiana Association

President: Leland Lusk, Shelbyville.
First Vice-President: J. F. Hardwick, South Bend.
Second Vice- President: James D. Atkinson, Bicknell.
Treasurer: Henry L. Dithmer, Indianapolis.
Executive Secretary: Robert W. Walton, Indianapolis.

Michigan Association

President: Max Borin, Detroit.
First Vice-President: Douglas Taggett, Kalamazoo.
Second Vice-President: Eugene T. Scott, Grand Rapids.
Secretary-Treasurer: Edward W. Jackson, Kalamazoo.

Annual Ice Sales Survey

THE questionnaire for the 1956 Ice Sales Survey went into the mail by the National Association of Ice Industries during February. This brief, single-page form is mailed out each year at this time. From reports sent in by members of the Industry, the association is able to compare last year's business with the sales and developments of previous years.

From these figures, the trend of Ice sales and the type of service offered is measured; Standards by which dealers can measure their progress in relation to that of the Industry as a whole is determined; Creditable, up-to-date information is furnished on sales and service of the Industry to agencies of the Federal Government with which the Industry has to deal — even in peace time; Statistical facts are developed which can be used to encourage and support favorable comments about the Industry in the press.

The figures submitted are held in strictest confidence, only combined and weighted averages are released and the report is destroyed or returned, as soon as the figures are taken off and combined with those sent in by other companies.

Texas In Review Features Ice Industry

THE Texas Ice Industry was featured over 23 television stations throughout Texas on the Humble Oil & Refining Co. program "Texas in Review" the week of February 18. One of the brains behind this fine public relations idea was Swanie Udden, prominent member of the National Association of Ice Industries.

The Humble Oil show gave splendid and well-deserved recognition to the importance of the Texas ice industry. The high point of the show was the modern ice plants which are being operated and the modern services which are being made available to its customers.

Indianapolis Newspaper Boosts Ice in Feature Story

A RECENT issue of the Indianapolis News carried a story by Bart Grabow, Business Editor, about the Ice Industry. Icemen generally will be interested in a few paragraphs from it!

One survey reveals that 97 out of every 100 families in the Indianapolis area now own mechanical refrigerators. But don't waste your time pitying the ice industry. It's far from being in the doldrums and icemen are using new merchandise approaches to add strength to a basic business.

Most dramatic development in the ice business, says Robert W. Walton, secretary of the Indiana Association of Ice Industries, has been the arrival of the automatic vending machine. Almost all vendor customers have home refrigerators. But whenever they need extra ice for parties, picnics and the like they buy it by the bag and block at a vending machine.

Gross profit on bag ice is far above that on the old home-delivered block ice. So while total ice production tonnage is down from a few years back, revenue from ice sales reflect a truer and more optimistic picture of the industry's health.

About 65 mechanical ice vendors operate in the Indianapolis area now, says Walton. Most of them are less than five years old and each represents an average investment of some $5,000. Depending upon location, each vendor will gross $4,000 to $5,000 a year with a gross of $8,000 to $10,000 possible at an exceptionally good location.

Last year there were more than 8,000 automatic vending outlets for ice in the United States, a 14 percent increase from 1954.

Public Warehouses Help Maintain Product Quality

AS A PART of its quality control program one of the large frozen food packers makes an annual on-the-spot check of the care being given its products during distribution. This includes visits by its quality control personnel to both public and private refrigerated warehouses where one of the important things checked is storage temperature. Findings of most recent inspection showed that product protection in private warehouses was poor with more than half of them having temperatures "in the danger zone". No such widespread off temperature conditions were found in public refrigerated warehouses.—NARW Quick Sheet.

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Book Reviews

PUMP SELECTION AND APPLICATION. By Tyler G. Hicks, Published by McGraw Hill, New York. 432 pages. Illustrated. Price $8.50. For sale by Nickerson & Collins Co., Chicago, Ill.

TO SHOW the reader how to get more economy and efficiency from pump installations, in all the diverse fields where this equipment is used, is the objective of this book. Besides discussing the basic types of pumps and problems met in their application, the book devotes a chapter to each of a number of industries and their pump problems. These include air conditioning, power-plant services, nuclear-energy applications, petroleum, chemicals, paper, textiles, rubber, food, water supply, sewage, heating, irrigation, flood control, mining, construction, marine, hydraulic, iron, and steel.

Pumping problems peculiar to each industry are covered, with step-by-step procedures for analyzing pumping problems, finding the most suitable commercial pump for the job, and applying this pump to the job conditions. Many illustrative examples are included. Some of the special topics covered are pumping-system economic analyses, pump specifications, comprehensive analyses of the pumping requirements for a variety of industries, major discussions of pump head, liquid handled.

The book covers the entire field of industrial pumping, from tiny units handling just a trickle to giants pumping hundreds of thousands of gallons per minute. Many of the practical problems included are useful in reviewing for the stationary, mining and professional engineer's license examinations.

The author is Instructor in Mechanical Engineering, Cooper Union School of Engineering (Evening Division), formerly special projects editor, "Power," and author of another book "Plant Engineer's Easy Problem Solver."

AIR CONDITIONING — REFRIGERATING DATA BOOK, Applications Volume. Willis R. Woolrich, Editor-in-Chief, Dean, College of Engineering and Director, Bureau of Engineering Research, University of Texas. Published by The American Society of Refrigerating Engineers, 234 Fifth Avenue, New York 1, New York 1956, 1100 pages, 6½ x 9 in., leather-type cover. Price $10.00. For sale by Nickerson & Collins Co., 433 Waller Ave., Chicago, Ill.

This is a sixth edition, written by 90 experts. This new edition contains 60 chapters. Complete revisions have been made in eight chapters and moderate revisions in 26 chapters. Extensive changes in the bibliography have been made in two chapters. Most of the remaining chapters have been revised, to bring them up-to-date with latest practices.

Authors and associate editors were chosen because of their experience and eminence in their particular fields. This method of selection plus the ASRE Technical Committee's critical review procedure insures that each chapter is the consensus of those best qualified for the job.

This volume includes design information, formulae, tables, diagrams, and sample engineering calculations in factual handbook style presentation. There are 375 illustrations and 105 tables. The Classified Section lists manufacturers of components and assembled units of air conditioning and refrigerating equipment.

It should interest and be particularly useful to application engineers, architects, consulting engineers, contractors, executives, operating engineers, students and others.

A SCIENTIFIC SAMPLER, First Edition, By Raymond Stevens, Howard F. Hamacher and Alan A. Smith, past and present editors of the Arthur D. Little, Inc. Industrial Bulletin. Published by D. Van Nostrand Company, Inc., Princeton, N.J. 430 Pages. Price $6.00. For sale by Nickerson & Collins Co., Chicago 44, Ill.

This book contains a collection of reports, predictions and reflections of the Arthur D. Little, Inc., Bulletin's thirty years of publishing, collected and annotated in a unique chronicle of scientific progress. It covers the whole area of the applied sciences. Some of the chapters record accomplished milestones in research and engineering and some of them point the way toward developments yet to come. Scientific ideas have changed so radically and rapidly that it is difficult to find a compact amount of research and technical development that is comprehensible to a reader who is literate but not necessarily technically trained. This book is expected to fill that need.

New Ice Rink Planned

A STEP toward securing an artificial ice skating rink has been taken by Highland Park, a suburb of Detroit. The Council named a five-man committee to study the feasibility of a rink after 41 persons presented a petition. The committee could go into the financing phases, separately.

Fire Damages Ice Plant

FIRE caused $10,000 damage to The Lone Star Ice & Food Store, San Antonio, Texas. Firemen fought the blaze for two hours. It was the second within a week at the ice plant. Both fires were believed to have been started by workers using acetylene torches.

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Chicago ASRE Features Home Conditioner Talks

LIQUID Ammonia Recirculating and Return Systems was the title of Professor W. F. Stoecker's talk, the feature of the February dinner meeting of Chicago Section ASRE. Professor Stoecker, Mechanical Engineering Department, University of Illinois, Urbana, presented a condensed review of his work on this topic which had previously appeared in detail in INDUSTRIAL REFRIGERATION, November and December 1955. The discussion was illustrated by means of slides taken from the Professor's original text.

His talk was followed by a Question and Answer session which brought out some additional research or experiments by the author on these two topics. Conclusions drawn from these practical experiments were that the systems utilizing a mechanical pump were slightly more efficient than those utilizing valving and gas pressure schemes. However the observation was made that it was a lot simpler to replace defective solenoids or valve parts than to maintain a stand-by pump.

Lack of aggressive salesmanship may account in large part for the small number of central-air conditioning units now installed in homes, according to Bill Brown and Severn Wallis, Kinetic Division, Dupont Company. These two representatives handled the discussion session sponsored by the Committee for Service to Engineers, and relayed for the most part statistics and information contained in a recent Dupont survey.

Ninety-three per cent of about a thousand owners of homes not now air conditioned in metropolitan areas throughout the nation said they have never been contacted by an air-conditioning salesman. Of those not contacted, 26 per cent said they have seriously considered some sort of cooling relief for their homes, and about half of them are potential sales targets for room air conditioners while slightly more than a quarter of them are prime prospects for central air conditioning.

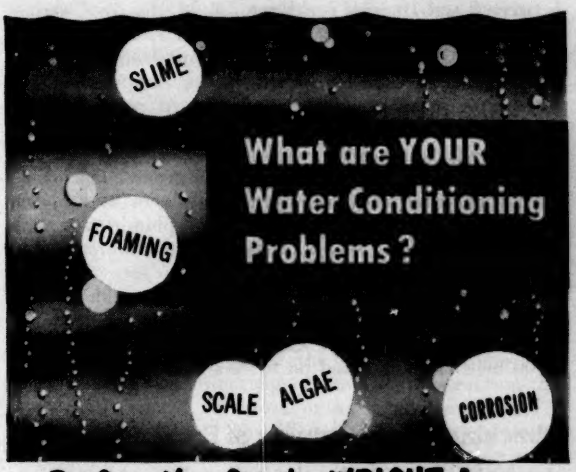
In fact, DuPont's "Kinetic" Chemicals Division says, the survey indicates an immediate market for at least 270,000 central residential air-conditioning systems in metropolitan areas alone. Representing a retail market potential of at least a quarter of a billion dollars, that market, if realized, would more than double the number of homes now cooled by central refrigerated systems.

The Du Pont study was based on a scientific sampling system that included personal interviews with 605 owners of homes now centrally cooled and 1,066 owners of non-air-conditioned homes in 53 geographic areas of the country.

Merger of Ice Cream and Milk Associations

A REPORT on the progress of the Special Study Committees appointed to consider the possible consolidation of the International Association of Ice Cream Manufacturers and the Milk Industry Foundation has been issued by Robert C. Hibben, executive secretary of IAICM, and Richard J. Werner, executive director of MIF.

In their joint statement, the two association executives said that no action can be taken until the study committees have reported to their respective boards during the October 1957 conventions of the two organizations. The final decision will rest with the members of both organizations, since any actions taken by the Boards of Directors of the organizations will have to be approved by the respective memberships.



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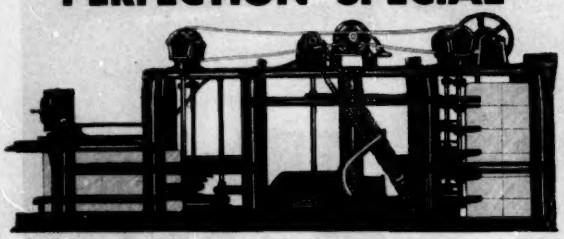

The PERFECTION SPECIAL receives ice blocks on edge, scores them lengthwise first. Then heads up the blocks, scores them crosswise and discharges them standing on end. This is a combined heading and scoring machine and scores the blocks into any size pieces desired in one complete operation. Capacity is 4½ blocks per minute or 270 blocks per hour.

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Designed for fast operation, the twin spouts let the operator remove one bag and replace with an empty. The second bag on the weighing platform has filled, the weight has stopped the machine. The minute the operator removes the filled bag, the scales move upward and starts the mechanism filling the second bag. The operator has only to move the flap in the dividing head the second he has installed the empty bag, this must be done before removal of full bag.

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Ice Scoring Machine Co.
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Fort Worth, Texas

Farm Refrigeration of Eggs

MUCH interest is being shown in how much mechanical refrigeration costs, and how large the flock should be in order to make farm refrigeration of eggs pay, according to Denver B. Bragg, associate poultry husbandman at Virginia Polytechnic Institute. Bragg explains that farm refrigeration does not mean cold storage; it means holding the temperature around 50 or 60.

According to a report from Michigan State University the cost of electricity for a commercial egg-cooler that took care of 10 to 11 cases and held the temperature at about 58 was 0.4 cents per dozen, figuring electrcity at 3 cents per kilowatt hour. The total cost, including the cost of the cooler, interest on the investment, and the electricity, was figured at 1.3 cents per dozen. The test was run for seven months, February through August, and the cost of the equipment presumably was pro-rated over a period of 8 to 10 years.

Another study on the cost of operating egg-coolers, reported by Texas A & M College, showed that an average of 1.5 kwh of electricity was required per case for on-the-farm coolers, and about 0.8 kwh per case for the cooler at the collecting station. On the basis of the study (which was conducted April through July) eggs sold twice a week on a Grade A market, from 1,000 hens producing a little over 17 dozen eggs per bird, would bring $264 or a little more than 1.5 cents per dozen more than when no refrigeration was used. Although the figure may not be exactly the same for a year-round study, it gives some idea of what to expect, Bragg says.

The eggs in the Texas study were stored at 55 on the farm and there was about five cents difference in selling price between grades. In Virginia the average difference between Grade A and Grade B eggs will run somewhere between 8 and 10 cents per dozen.

Premiums that can be expected as a result of on-the-farm refrigeration of eggs seem to run from about 0.5 to 2 cents per dozen. Frequency of pick-up as well as whether or not a premium is paid for AA eggs, and the spread in price between grades, also is a factor.

Farm egg refrigeration units can be set up by installing cooling units in insulated walk-in type rooms which can be made by modifying existing walls, or by building entirely new structures, or by the use of plug-in type coolers which can be bought from several different companies.

Bragg says the cooler should be large enough to hold from 12 to 14 cases (3 to 5 of which would be empties that are cooling) plus at least six wire baskets for each 1,000 hens. This is based on twice-a-week sales.

Checking Temperatures of Frozen Foods

A USEFUL guide for those who check the temperatures of frozen food shipments has been issued by the Marketing Research Division of the U. S. Dept. of Agriculture as Marketing Research Report No. 150.

It pays to use a thermometer of good quality, it says. Accurate temperatures cannot be expected from a poor one. Either a glass stem thermometer or a metal dial thermometer is recommended for taking the temperature of frozen foods, chilled or frozen meat and poultry, fresh fruits, fresh vegetables, and dairy products, where the thermometer will be inserted less than five inches. Characteristics of the glass stem thermometers, the metal dial thermometer and the metal point thermometer are spelled out in detail.

It is necessary to make a hole in some products, particularly frozen items, in which to insert the thermom-

eter. Make the hole with an ice pick, hand drill, or other pointed tool. The tool should be slightly larger in diameter (approximately 1/64-inch larger) than the diameter of the thermometer stem.

The thermometers used for checking the temperatures of food products should be tested every week, or as often as is necessary to insure their accuracy. The test can be made by immersing the thermometer in an ice and water bath. Fill a pint-size container with chipped ice and then add water. Stir for two minutes and then immerse the thermometer for two minutes in the center of the mixture. The thermometer should read within one degree, plus or minus, of 32 F.

Several packages of the product should be tested in the warehouse before the packages are loaded into the car or truck. Selecting the test packages is a matter of judgment, but they should be selected in such a way that their temperatures will be representative of the entire load.

Increase Use of Aluminum For Heat Exchangers

ALUMINUM was the prime surface used for the heat exchanger in the nitrogen wash scrubbing system pictured on the cover of the March INDUSTRIAL REFRIGERATION and described in the article on Purifying Gas at Minus 300 F. According to the Chemical Trade Journal and the Chemical Engineer, November 1956, the use of industrial heat exchange equipment is on the increase. The Journal points out that comparative costs, weight and corrosion resistance of aluminum tubing makes this material particularly advantageous for this application. According to the Journal the following technical characteristics are available through the use of aluminum:

Aluminum tubes resist corrosive attack by cooling waters with pH of 4.5 to 8.5. Thermal conductivity is about one-half that of copper, 3 times that of mild steel and 14 times that of stainless steel. Loss of heat transfer due to scaling is also less than with other metals. The absence of corrosion products greatly reduces fouling, resulting in significant savings in operation costs. Discoloration and sludging of products are eliminated or greatly reduced. Aluminum does not promote the breakdown of unstable substances, such as hydrogen peroxide. Aluminum alloys are not subject to brittleness at low temperature but become stronger and more ductile as temperature decreases.

Coordination of Refrigeration Standards

ON recommendation of the American groups concerned, the American Standards Association has voted in favor of initiation of an international project on refrigeration, and has offered to serve as secretariat.

In view of the widespread use of refrigeration in all parts of the world, it is essential for international trading that there should be coordination of national standards, particularly of terminology and testing techniques, explained the British Standards Institution which proposed the project. As suggested, the program of work would coordinate national standards of terminology and definitions; manufacture and testing of household and commercial refrigerators and food freezers; rating and testing of main components of refrigerated air-conditioning units; and safety.

The proposal touches upon the work of a number of ASA projects, including refrigeration safety, B9; piping, B31; household refrigeration, B38; refrigeration on shipboard, B59; expansion valves, B60; flare fittings, B70; air-conditioning symbols, Y32; nomenclature, Y53; and gas refrigeration, Z21.

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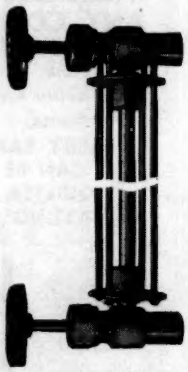

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Effective Utilization of Engineering Personnel

ACUTE shortage of engineering, scientific and technical, personnel in the major industries of the United States prompted a conference for engineering administrators and personnel executives at Kellogg Center at Michigan State University on March 29 and 30. This conference on the effective utilization of engineering personnel was presented by the Labor and Industrial Relations Center, MSU. Michigan Society of Professional Engineers College of Engineering, MSU.

Specific objectives of the conference were (1) to define problems in the utilization of engineering personnel and describe experience with various solutions; (2) to present latest research findings by experts in this area, and (3) to facilitate the interchange of ideas between personnel executives, engineering administrators, and university faculties.

Two conclusions or solutions to the shortage problem were developed by the conference discussions and presentations. The first is to increase the number of trained people by expanding and improving training facilities in universities and technical schools. The second is to make vast improvements in the utilization of available and already existing personnel. Both approaches are essential, but immediate results are possible only by means of the second approach — improving the utilization of engineering, scientific and technical personnel.

The planning committee which handled the conference included seven representatives of the Labor and Industrial Relations Center and the College of Engineering at MSU. Five local officers of the Michigan Society of the Professional Engineers group represented the professionals in the industry.

Frozen Food Convention To Include Exposition

THE National Association of Frozen Food Packers has announced today that the 1958 National Frozen Food Convention, scheduled for the Conrad Hilton Hotel in Chicago, March 2-5, will include an industry exposition. NAFFP president Sterling B. Doughty said that the Association plans to return to the original convention format which it instituted for the industry in 1947. This means, he explained, that both the convention program and the exhibition will be under sole sponsorship of NAFFP as before. The exhibition will feature machinery, equipment, supplies, and services which are offered to the frozen foods industry for packing, transporting, storing, distributing, displaying, and selling its products.

"There has been a great deal of demand from packers," Mr. Doughty said, "for an exhibition aimed more directly toward their interests than has been the case since 1949. In recent years the exhibits have been dominated by displays of actual frozen products of the industry."

This will be the first year since 1954 that NAFFP has held its National Frozen Food Convention separate from the National Frozen Food Distributors Association. In that year NFFDA sponsored its National Frozen Food Merchandising Convention and Exposition about three weeks after the NAFFP convention and display. "The decision to hold separate conventions in the future was made jointly by NAFFP and NFFDA last summer," Mr. Doughty added. "This was done because of the tremendous growth of the industry and the increasing difficulty of securing adequate convention facilities in any city without spreading over too wide a hotel area."

Committee to Develop New Standards for Air Conditioning

THE American Society of Heating and Air-Conditioning Engineers and the American Institute of Architects have appointed a joint committee to encourage greater cooperation between consulting engineers, architects and the air conditioning industry. John E. Haines, past president of ASHAE from Minneapolis, Minn. and Paul Schell, AIA member from Pittsburgh, Pa., were appointed co-chairmen at a recent organizational meeting.

Additional ASHAE committee representatives are Cary B. Gamble, New Orleans, La.; Herman C. Hoffman, Syracuse, N. Y.; Society 1st Vice President, Peter B. Gordon, New York, N. Y., and John Everetts, Jr., Philadelphia, Pennsylvania. AIA members include James B. Newman, New York, N. Y.; George S. Idell, Philadelphia, Penna., and Angelo R. Clas, Washington, D. C.

At the meeting committee members were assigned subjects for study and development to provide information of mutual interest. Haines and Hoffman of ASHAE are to compile data on the cost for and benefits from air conditioning commercial and industrial new buildings.

Standards for air conditioning buildings, as determined by geographical area, type of building, use and occupancy, are to be developed by Gamble, Gordon and Everetts of ASHAE. This information is to include facts about temperature, humidity, cleanliness, air movement and noise levels. Cautionary details also will be given on the effect of light loads, window areas and insulation on the cost and effectiveness of air conditioning.

The additional costs for the installation and operation of an air conditioning system in buildings with large glass areas will be investigated by Hoffman of ASHAE and Schell of AIA.

COMING CONVENTIONS

GEORGIA ICE MANUFACTURERS ASSOCIATION
May 5-6, 1957
Henry Grady Hotel, Atlanta, Ga.
Mildred Nichols, Secretary

AIR CONDITIONING & REFRIGERATION INSTITUTE
May 5-8, 1957
The Homestead, Hot Springs, Va.

CANADIAN WAREHOUSESMEN'S ASSOCIATION
May 13-16, 1957
Harrison Hot Springs Hotel
Harrison Hot Springs, British Columbia

AMERICAN SOCIETY REFRIGERATING ENGINEERS
June 2-5, 1957
Hotel Fontainebleau, Miami Beach, Fla.
R. C. Cross, Executive-Secretary.

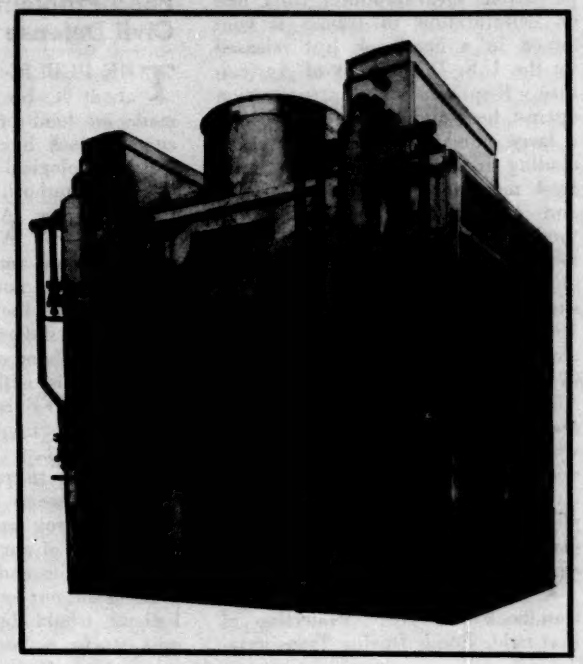
WESTERN PLANT MAINTENANCE & ENGINEERING
June 11-13, 1957
Civic Auditorium, San Francisco, Calif.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS
November 14-16, 1957
Shoreland Hotel, Chicago
R. C. Cross, Executive Secretary, New York City

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS
November 18-21, 1957
Hotels Del Prado & Sherry, Chicago
J. R. Kelahan, Secretary

AIR CONDITIONING & REFRIGERATION EXPOSITION
November 18-21, 1957
International Amphitheatre, Chicago, Ill.
George Mills, Show Director.

Large refrigeration plants save money with NIAGARA high efficiency condensers

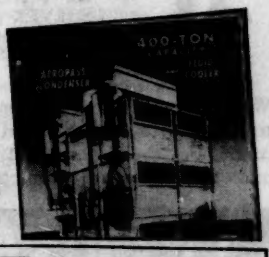


In size ranges from 100 to 450 tons refrigeration Niagara's "Super" Condensers save power, save large cooling water and water handling expenses and help the user avoid most of the upkeep problems and troubles of a refrigerating plant. Always full condensing capacity is assured by the "Duopass" pre-cooling coils which remove the superheat and bring about condensing at low temperatures. Complete accessibility assures labor saving, inexpensive upkeep.

NIAGARA BLOWER COMPANY
Dept. I.R.-4, 405 Lexington Avenue
NEW YORK 17, N. Y.
District Engineers in Principal Cities

Write for complete information.

Ask for Niagara Condenser Bulletins 123 and 131.



NIAGARA *Over 40 Years Service in Industrial Air Engineering*

Better Transportation of Perishable Foods

INFORMATION on how to protect motortruck shipments of perishable farm products from loss or deterioration in transit is contained in a handbook just released by the U.S. Department of Agriculture. Requirements for protection against heat and cold are shown for a large number of commodities, including fresh fruits and vegetables, fresh meat and meat products, dairy and poultry products, and frozen foods. Methods of loading these commodities in trucks and truck-trailers to obtain the best results are also suggested, and there are more than 70 illustrations depicting loading techniques for different commodities in various types of containers.

Agricultural Marketing Service researchers compiled the data much of which was previously available but widely scattered and difficult to find, into this easy-to-use handbook. Supplements to the handbook are planned as additional information becomes available.

A single free copy of Agriculture Handbook No. 105, "Protection of Perishable Foods During Transportation by Truck", may be obtained from the Office of Information, U.S. Department of Agriculture, Washington 25, D.C.

Food Problems in Civil Defense

THE PUBLIC hears little enough about it, but studies are being made on food problems in case of enemy attack by radiological, chemical or biological methods.

Under authority of the Federal Civil Defense Administration, the Food & Drug Administration conducts courses among its people in the states and now plans are under way to extend the training to people in the food industries. Recently, Dr. Lowry Beacham of F&DA discussed the problems with the Director of TRRF. NAFFP is taking major responsibilities in the training program.

According to recent estimates by USDA, an enemy attack might damage or destroy as much as a third to two-fifths of our refrigerated warehouse facilities and knock out similar portions of our other food supplies. Fall-out would be very severe on milk stocks — less severe on meat.

British Plant Operates Deep Freeze Test for Autos

ONE of the coldest spots in Britain is an "ice box" where temperature is minus 34 degrees centrigrade, and where cars almost always start in a few seconds. This refrigeration room, where a car may sprout foot long icicles in a few minutes and the chill cuts through your heart in spite of "Arctic-explorer" protective clothing, is at the Austin Motor Company's Longbridge, Birmingham, works. The cold is so intense that ungloved hands are "burnt" on contact with metal work.

But it might be seen in any one of a number of British motor factories. It is an illustration of the care which manufacturers take to insure that their cars can "live" in sub-zero temperatures when the existence of the driver may depend on his engine's ability to start.

The car is first "soaked" for up to 48 hours in the refrigeration chamber where the temperature is lowered to below zero. The engine must start within thirty seconds. These deep freeze tests enable the capacity and size of the battery and the suitability of various grades of oil to be decided on. They also give evidence as to the state of health of the fuel system and carburation in these temperatures.

Gerber Experiments With Shipping Loose Fruit

THE Gerber Baby Food Company ships annually many carloads of pears from California to their processing plants in the East. The practice in the past has been to precool the pears in cold storage rooms in wooden lug boxes, load the fruit in these containers into the cars, bunker ice the cars, and ship them East. R. W. (Prof.) Davis of The Union Ice Company, San Francisco, whose company has been cooperating with Gerber on the new shipping methods, gives this account of the tests:

"We cooperated this year on some shipments wherein they boarded up the refrigerator car doorways to a height of about 4½ feet. Then the pears were dumped loose into the car. In other words, the entire length of the car contained loose pears piled approximately 4½ feet deep. On top of the pears we blew a layer of ice approximately one foot thick. Without previous precooling, these pears arrived in the East in excellent condition and this method of handling resulted in considerable saving to the Gerber Company."

DISTILLED WATER?

NO...

DISTILEX

Distilex renders raw water the same as distilled water for ice making, and increases tonnage production by decreasing the number of hours required to freeze untreated water.

Distilex, safe and easy to use, prevents white butts, and eliminates cracking while ice is being frozen, dumped or cut. Economical—Distilex costs less to use than cracked bar losses.

USE SOLVEX

An effective cleaner for spray ponds and cooling towers, SOLVEX goes to work immediately without costly shutdowns. Cooling efficiency is rapidly restored by using 1½ pounds per 10 gallons of water.

Write for complete information on these aids to better ice making and cooling, manufactured by the Chemical Solvent Company—makers of quality products for decades.

CHEMICAL SOLVENT CO.

P. O. Box 487 Birmingham, Ala.

News of PEOPLE

Glenn Appointment

THE appointment of John H. Glenn, president of the Glenn Ice & Fuel Company, Beardstown, Illinois, as a director of the H. D. Lee Company, Kansas City Mo. has been announced. The H. D. Lee Company manufactures work and utility clothing, operating thirteen factories from coast to coast. It is now in its 67th year. Mr. Glenn is a third generation stockholder in the H. D. Lee Company. His grandfather, John H. Harris, was a business associate of H. D. Lee, founder of the H. D. Lee Company, in his various enterprises. Mr. Glenn's appointment as a director of the company was announced at the 67th annual stockholders' meeting in Kansas City.

V. C. STEVENS, vice-president of Alford Refrigerated Warehouses of Dallas, has been appointed chairman of the warehouse operations, storage and handling committee of the National Association of Refrigerated Warehouses.

B. A. BARROSSE has retired as manager of the American Service Company and Ice Service Inc., at Asheville, N. C. after serving 32 years. He and Mrs. Barrosse plan to make their future home in Fort Lauderdale, Florida. Mr. Barrosse began work as a bookkeeper in 1925 with the old Electric Ice Company when it was organized. In 1932 this company was purchased by the American Service Company and he was promoted to manager.

DEATHS

S. A. Martin

THE DEATH of S. A. (Steve) Martin, Centerville, Iowa, one of the early ice producers, occurred at his home in Centerville recently. He was 85. Mr. Martin was manager and operator of the Centerville Pure Ice Company which he founded in 1905. This was one of the more progressive ice concerns in the State of Iowa and served nearly twenty-five communities in the vicinity of Centerville. He also was one of the founders of the Iowa Clay Products Company of Centerville, but disposed of this interest several years ago.

He was a member of the National Association of Ice Industries and for many years was active in the Iowa Ice Association. He was a former state representative from Appanoosa County, was active in civic affairs and was a leader in setting up the "scrip" plan under which Centerville instituted its own medium of exchange for a time during the depression.

Charles C. Stringfellow

THE DEATH of Charles C. Stringfellow, Shreveport, La., occurred after a long illness March 3. He was 61. Mr. Stringfellow was an executive of the Independent Ice & Cold Storage Co., and a member of the Masonic Lodge. He was the son of Thomas Leveret Stringfellow, a pioneer Shreveport resident.

CLINTON J. ALLGOOD, Seattle, Wash., retired refrigeration engineer, died January 26, in a Seattle hospital after a week's illness. He was 79 years old. A native of Iowa. Mr. Allgood had lived in Tacoma about 50 years.

There is no better method of purging than with an

ARMSTRONG PURGER

HERE'S PROOF:
Free Bulletin No. 2212 tells how an Armstrong Purger can cut your refrigeration costs and give you more capacity.

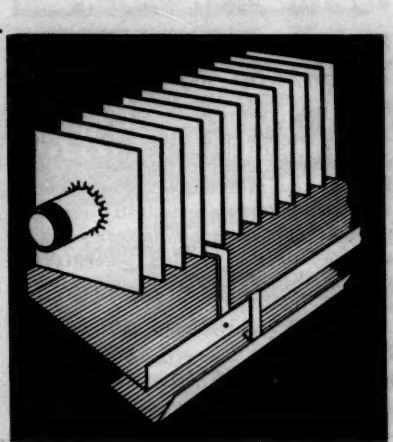
TYPICAL RESULTS

- "*Power Costs cut 10%*"— Rubenstein & Son Producers, Inc., Dallas, Texas
- "*$500 annual ammonia saving*"— Howard Johnson Ice Cream Mfg. Plant, Baltimore, Md.
- "*Compressor capacity raised 10%*"— Gulf Oil Corp., wax plant, Philadelphia, Pa.

Unconditionally Guaranteed
Try the Armstrong Purger for 30 days. If you're not completely satisfied you can return it for a full refund. Send for your free copy of Bulletin No. 2212. Write today to:

ARMSTRONG MACHINE WORKS
8602 Maple Street, Three Rivers, Mich.

This new finned pipe is available in lengths of 5', 6'8", 10' and 20' — and with fin spacings of 1" and 1½" — to fit every application.



FRICK

Square-finned Pipe

Is ideal for cold storages, freezers, food processing and meat packing plants, etc. Manufactured from 2" dia. F.W. steel pipe and 7" square 14- gauge fins, Frick finned pipe gives maximum heat transfer per dollar invested. Each fin is bonded to the pipe under tons of hydraulic pressure. All assemblies are hot-dip galvanized.

These new Frick finned coils require only one-quarter of the space needed for bare pipe having the same surface. See your nearest Frick Branch or Distributor for complete details, or write for Bulletin 158.

DEPENDABLE REFRIGERATION SINCE 1853
FRICK CO.
WAYNESBORO, PENNA. U.S.A.

Heating & Air Conditioning Engineers Annual Meeting

(Continued from page 18)

systems; for the packaging of pharmaceutical products; for the safeguarding of cargoes, the preservation and preparation of certain alloys; and even the application of dehumidification in connection with gas cooled transformers and wind tunnels. He concluded with the comment that the chemical desiccants have definite advantages over refrigeration for low relative humidities of less than 30 percent R.H.

Semi-Annual Meeting Air Conditioning Engineers

THE Semi-Annual Meeting of the American Society of Heating and Air Conditioning Engineers will be held June 24, 25 and 26, 1957 in the Manoir Richelieu, Murray Bay, Quebec, Canada with interesting papers and two symposiums planned for the three day meeting.

One of the symposiums is on Air-Conditioning Instrumentation and it will be moderated by Prof. C. H. Pesterfield, East Lansing, Mich. The other, a symposium on Sound and Vibration is to be moderated by J. B. Graham, Buffalo, New York.

Factories To Account For More Air Conditioning

MORE factories in the United States will install comfort air conditioning in 1957 than ever before as the industrial cooling trend gains momentum, an industry leader predicts. The nation's factories will account for the greatest percentage gain in the air conditioning market, it was anticipated.

Although less than one per cent of U. S. factory space is air conditioned, there is a marked trend developing in this field, according to D. C. Minard, president of The Trane Company, manufacturing engineers in air conditioning, heating, ventilating and heat transfer. Minard pointed out that square footage in U. S. industrial plants is 50 times greater than the floor space in office buildings, where air conditioning is now widely accepted. "Obviously," he said, "the market potential here is tremendous once factory air conditioning gains widespread acceptance." Such acceptance may not be far away.

Minard cited a survey made by a cross-section of his firm's 92 regional sales offices across the nation. The offices queried leading architects and consulting engineers in their areas on the trend toward factory air conditioning for comfort and efficiency of employees. It was found that the trend was especially rapid in the South, where consulting engineers estimated that 50 per cent of all first class factories would be air conditioned by 1960.

It was reported also that the trend was spreading to the North, especially in factories involving high skills, such as work in electronics. Factors in the trend include competition for skilled help, the desire to maintain employee efficiency in hot weather, reduce absenteeism, lessen employee turnover, and improve employee morale.

Frozen Oysters

REGULAR and breaded frozen oysters look like a promising new industry, according to some observers. Reports from the recent meeting of the Oyster Institute have an optimistic tone. The Acronizing treatment (aureomycin) may prove applicable, as it has with poultry, for fresh and frozen product.

The results that Dr. E. A. Fieger and associates of Louisiana State University have obtained point up the importance of packaging that reduces or excludes contact of the frozen product with air. With vacuum packaging, which removes air (and oxygen) from the container, storage life of frozen oysters was satisfactory for nine months. Glazing with ice containing some salt protected quality almost as well. A well-maintained, undamaged glaze will, of course, exclude air also. Packaging with an overwrap only was less successful; within six months the product had developed noticeable rancidity.

Loss of weight from loss of liquid (fragility) is considered to be due to any kind of physical stress, such as a rise in temperature, by L. E. Fairbanks of Tulane University. — TRRF Bulletin.

Weight-Saving Aluminum For Truck Electric Plates

IN THE constant effort to reduce weight and by so doing increase payload, a dairy products firm has found it can save approximately one-third of a ton in a seven-ton truck by replacing heavier metal cold plates with aluminum. The Isaly Dairy Company, Pittsburgh, Pa., whose trucks must be kept at frigid temperatures while delivering food cargoes, is testing aluminum cold plates in one of its "iceless" refrigerated trucks.

The cold plates are actually thin, rectangular aluminum tanks installed inside the van section which are filled with a brine solution and frozen "flint hard" before the start of a run by means of liquid ammonia. Three small plates installed in a small forward section of the trailer maintain ambient temperatures of 0 to 10 F for ice cream, while two larger plates are bolted in the more spacious rear area to keep milk, eggs and butter at 40 F.

KRACK 25th ANNIVERSARY MODEL

KRACK LOW TEMPERATURE Electric Defrost Unit Cooler

- Completely automatic.
- Fewer defrost periods needed.
- Insulated cabinet retains, circulates heat when closed . . . speeds defrosting.
- Internally wired for easy installation.

Get New Bulletin ED-1055 for details

KRACK REFRIGERATION APPLIANCES, INC.

911 W. Lake St.
Chicago 7, Ill.

WHOLESALER: United Refrigeration Supply. CONTRACTOR: Poletti Refrigeration Service. USER: Liberty Cash Grocery Warehouse, Memphis, Tenn.

MANUFACTURERS' NEWS

Strickland Named York District Sales Manager

Chas. Strickland

CHARLES P. STRICKLAND, JR. has been named industrial sales manager of the Southwest District for the York Corporation, subsidiary of Borg-Warner, it was announced by Walter L. Pharo, Industrial Division General Sales Manager. Mr. Strickland, in his new assignment, will be responsible for the sale of York industrial air conditioning and refrigeration products in the states of Louisiana and Texas and portions of Alabama, Arkansas, Mississippi, and New Mexico. His headquarters will be in Houston, Texas.

Born in Santa Paula, California, Mr. Strickland is a graduate of the California Institute of Technology and served three years in the U.S. Navy in World War II, including two years as engineering officer aboard an aircraft carrier. He joined the York Corporation in 1946 and has served with the company's Los Angeles office as office engineer and sales engineer preceding his newest appointment. He is a member of the American Society of Heating and Air Conditioning Engineers and the Caltech Alumni Association.

Carrier Corporation Names New St. Louis Distributor

APPOINTMENT of Marco Sales, Inc., as distributor for Carrier Corporation's Unitary Equipment Division in St. Louis, Mo., was announced today by Russell Gray, vice-president and divisional general manager, Carrier. The new distributorship will cover the St. Louis Metropolitan area, southern Illinois and eastern Missouri through its 25-dealer organization. Marco Sales is in Carrier's Midwestern Region, which has headquarters in Chicago.

Principals of Marco Sales are Kenneth A. Hoffman, president and Gilbert L. Marks, secretary and treasurer. They have operated Hemminghaus, Inc., of St. Louis, specialists in electrical and air conditioning contracting. Marks will direct Hemminghaus, while Mr. Hoffman will devote full time to Marco Sales, Inc.

One of the first personnel additions to Hemminghaus engineering staff was Art O. Clementson, a past-president of Chicago Chapter, NAPRE. Clementsen, who was formerly with Julian Engineering Co., Chicago, for several years, and associated with Westerlin and Campbell Co., most of his career, is an experienced refrigeration and air conditioning man with much electric control background.

Carbide and Carbon Enters Fluorocarbons Field

PLANS to build a 50 million pound per year unit to manufacture fluorocarbons have been announced by D. B. Benedict, President of Carbide and Carbon Chemicals Company, a Division of Union Carbide and Carbon Corporation. The fluorocarbons production unit is to be built at the Institute, West Virginia plant of Carbide and Carbon and is expected to be in operation by the latter half of 1958.

"The market for fluorocarbons as pressuring components for aerosols and as refrigerants has grown amazingly in the last twelve years," Mr. Benedict said, "and with Carbide's planned unit the total U.S. capacity will exceed 300 million pounds per year. Production and sale of the fluorocarbons is our first commercial step into the promising field of fluorine chemistry. Our research teams are working vigorously to provide new fluorine chemicals to meet industry's increasingly stringent requirements for new materials."

Freezing Equipment Sales Moves Into New Office

FREEZING EQUIPMENT SALES, Inc., has moved into its new office and warehouse at 1405 North Duke Street, it was announced March 1. The company was previously located at 423 West Market Street. FES specializes in refrigeration engineering and sales for the food industry, with installations dealing with food freezing, frozen food storage, apple storage and peach precooling.

As national representative for Fuller Company, Catasauqua, Pa., it has exclusive sales rights on FES-Fuller rotary boosters when applied to refrigeration. A patented continuous package food freezer is marketed nationally for use with ice cream, fruits or vegetables. The firm also installs custom engineered food freezing tunnels to fit plant facilities.

Styrofoam Price Reductions

PRICE reductions ranging from 10 to 15 percent on standard board forms of Styrofoam, Dow expanded polystyrene, have been announced by the Dow Chemical Company. Board forms of the plastic foam material, available in 3-foot, 8-foot and 9-foot lengths and 12-inch and 16-inch widths, are affected by the change. D. L. Gibb, sales manager of Dow's Plastics Department, said that the reductions, which took effect immediately, were a result of "increased efficiency due to improved production techniques." This is the fourth significant price decrease for Styrofoam in the past four years, he added. Styrofoam, produced by Dow in eight plants in five different locations across the country, is a lightweight, rigid foam commonly employed in the insulation, novelty, floral, buoyancy and protective packaging fields.

NOYO

Shredded

REDWOOD BARK

INSULATION

UNION LUMBER COMPANY

620 Market St., San Francisco

Los Angeles
Park Ridge, Ill.
New York

REMPE · PIPE BENDS AND COILS FOR REFRIGERATION

ALL MATERIALS
Stainless Steel, Copper, Steel

FOR AMMONIA & FREON

Headered evaporator coil for liquid cooling or low temperature blast freezing. Also suitable for use with low temperature brine.

Rempe Coils are accepted in the industry as quality equipment that gives long service without maintenance. Over 50 years experience in the coiling and bending of pipe is your assurance of quality workmanship.

Send details for price

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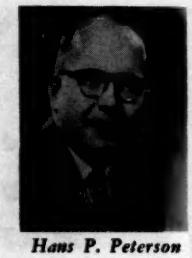
Kramer Trenton Expands New York Sales Office



Hans P. Peterson

A COMPLETE reorganization of the New York City Sales Office is announced by Charles Segal, general sales manager of the Kramer Trenton Co. Trenton, N. J. An office has been set up at 260 West Broadway, New York City, telephone Cortland 7-8442, where complete sales and engineering service is available to the metropolitan area, including Northern New Jersey. The operation will be under the supervision of Hans P. Peterson. Mr. Peterson has arranged an adequate inside staff to give quick and efficient engineering and sales service in response to telephone and letter inquiries. The size of the outside sales force is being increased to insure better field service.

Peterson has been with the Kramer Sales Organization for approximately two years and is well known in the refrigeration circles. A former resident of West Hartford, Conn., he now resides in Maplewood, N.J. and is a member of the American Society of Refrigerating Engineers and a registered professional engineer holding patents on a number of refrigeration applications.

Hubbell Appointment

THE appointment of A. E. Edwards Company of Seattle, Wash., as exclusive representative in the States of Washington, Oregon, Montana and Idaho has been announced by the Hubbell Corporation, Mundelein, Ill., manufacturers of solenoids and pressure regulators and safety valves for the refrigeration industry. The Edwards Company will maintain a stock of all types and sizes of Hubbell controls and replacement parts. A. E. Edwards has been affiliated with the refrigeration industry for many years, having previously represented York, Frick, and Niagara Blower in the new territory.

Borg-Warner Consolidates Hydraline with York

BORG-WARNER CORPORATION has announced that it has consolidated its Hydraline Products Division in Detroit, Mich., with its recently acquired York Division in York, Pa. The two divisions manufacture related products. Hydraline produces forced-water air conditioning systems and recessed room heating, cooling, and air filtering units. York is a nationally known manufacturer of air conditioning and refrigeration equipment.

Under the consolidation, Yorkco will expand its manufacturing program to include a new line of York-Hydraline air conditioning products. These will be marketed through the present Hydraline distribution system, serving primarily the plumbing and heating trade.

"Hydraline and its methods of distribution will complement our operations," said R. K. Serfass, vice president and general manager of York's Industrial Division. "At the same time the inclusion of some of York's developments will give Hydraline customers a better and broader line of products.

A sales program for the expanded operation was presented at a meeting in York on February 18 and 19, 1957 with representatives of more than 40 York-Hydraline Agencies from all regions of the United States.

Carrier Sales Increase

EARNINGS of Carrier Corp., in its first fiscal quarter ended January 31, fell below a year ago despite a slight increase in sales volume. The company reported first quarter net of $606,000, or 29 cents a share, against $729,000 or 36 cents a share in 1956. Sales climbed to $201,567,000 from $188,029,000 a year earlier. The drop in earnings, it is claimed, was caused by a strike at its Tyler, Texas, plant which began in November and is still on, plus reduced production "looking toward better-balanced inventories." In addition, the concern experienced "lower average margins than a year ago, which should be offset during the next several months." Orders booked during the first three

OHIO SPECIAL ICE CANS

WELDED — RIVETED

ICE CAN GRIDS

Industrial Trucks

and Trailers

THE OHIO GALVANIZING & MFG. CO.

NILES OHIO

For Sale by Sealed Bid

COLD STORAGE EQUIPMENT & MACHINERY

The Port of Seattle invites submission of sealed bids in connection with the sale of a considerable amount of used cold storage equipment and machinery presently located in its Bell Street Cold Storage Plant at Seattle, Wn. Sale items include compressors, motors, pumps, generators, wiring, cable, power switchboards, etc.

Detailed 7-page list of items offered can be obtained by calling or writing to addresses below. Material is open for inspection. This advertisement is not a basis for negotiation and Port of Seattle reserves the right to reject any or all offers, in whole or part. Preference will be given entire-lot bids.

Sealed bids will be received until 10:00 a.m. P.S.T. on Tuesday, May 28, 1957 at the addresses below, after which time they will be publicly opened and read.

JOHN P. JACOBS, JR.
Purchasing Agent
Port of Seattle

PORT OF SEATTLE

For further information, list of items offered or submission of bids —

Call at: Room 405, Bell St. Terminal, Seattle, Washington

Write to: P. O. Box 1878, Seattle 11, Wn.

months of fiscal 1957 amounted to $63,390,000, compared with $53,682,000 in the comparable period of 1956. At the end of the period, Carrier's backlog stood at a record $89,891,000 against a $67,330,000 total a year earlier.

Catalogs – Bulletins

New Truck Catalog

A NEW CATALOG, No. 357, on industrial trucks and trailers has been issued by the Ohio Galvanizing & Manufacturing Company, Niles, Ohio. This catalog of eight pages and cover is illustrated throughout and describes, with specifications, the trucks and trailers made by the company. Two pages are used to describe and illustrate heavy duty trailers designed to meet special needs of industry. Also described and illustrated are fifth wheel trailers with pneumatic tires, and with one piece tee section frame with longitudinal angles and hardwood deck.

Armstrong Dividend

DIRECTORS of Armstrong Cork Company have declared a dividend of 30 cents per share on the $1.00 par value common stock payable March 1 to shareholders of record February 11, and a dividend of 93-¾ cents per share on the $3.75 cumulative preferred payable March 15 to shareholders of record February 12.

ATTENTION —

Owners of Baker compressors and condensers - - - - -

We carry a complete stock of repair parts for all Baker ammonia and "Freon" compressors, condensers, valves and ice plant equipment.

CENTRAL ICE MACHINE CO.
5014 S. 24th St.
Omaha, Neb.

Classified Advertising

All classified advertisements are payable in advance. Except for Positions and Help Wanted classifications, this section is reserved exclusively for USED equipment.

RATES: 20c per word; minimum 25 words. $2.00 per line for bold face headings: $15.00 per inch for line listings.

Position and Help Wanted

POSITION WANTED—A well qualified manager of cold-dry storage warehousing facilities, with twenty-six years' experience in all phases of warehousing, has large following of national distributors for cold and dry storage merchandise. Can furnish best of references. Address Box AP-12, c/o Industrial Refrigeration.

USED EQUIPMENT—wanted & for sale

FOR SALE — Refrigeration equipment; ice equipment; new, used. Advise us your needs. Use "QUICKSEAL" — stops brine tank leaks; easy, efficient, economical. Born Company, 80 East Jackson Boulevard, Chicago 4, Illinois. WAbash 2-3299

FOR SALE—27 ton Frick ice plant; new 1953. 8 can lift auto-controls; 384- 300 lb cans; complete with many extras; for quick sale. Write People's Ice Co., 823-6th Ave. N.W., Minot, N. Dak.

FOR IMMEDIATE SALE—15 ton ice plant complete; operating condition; will sell for $5,000. as is, under condition no part of plant will be re-sold for establishment in our sales area. Write Dare County Ice & Storage Co., Manteo, N. Car., Phone 139.

FOR SALE—About 3 years old, complete 27 ton Frick ice plant; fully automatic, 8 can pull, designed for expansion to 35 ton. Bargain f.o.b. cars or trucks. Inspection through this office. Born Company, 80 East Jackson Boulevard, Chicago 4, Illinois, Wabash 2-3299.

WANTED—One little Giant ice crusher—Model MD-90-M with or without motor and stand. L. P. Ilgen, Brook Park, Lewisburg, Pa.

WANTED—Forty good ice cans 11x22x50 and distance not too far due to freight charges. Diamond Ice Co., Purcell, Okla.

FOR SALE—1 York ammonia compressor 12½x14½. L. P. Ilgen, Brook Park, Lewisburg, Pa.

FOR SALE—1-8x8 ammonia compressor, also a 5 x 5, 4 x 4 and 3 x 3 units, and used motors. The Gus A. Regnier Refrigerating Engineering Co., 532 Winchester Ave., P.O. Box 1093, New Haven, Conn.

FOR SALE—4x4, 5x5 Frick. 5x5, 8x8 Yorks. 15 ton shell & tube condenser. 7½ and 9x9 York crank shafts. Write E. Niebling, 1546 St. Clair Ave., Mt. Healthy, Cincinnati 31, Ohio.

FOR SALE—Western location; vilter 6½ x 6½, 30 h.p., 20-ton cap.; 2 vilter 7½ x 7½, 40 h.p. each, 30-ton cap. each; Vilter 7½ x 7½, 50 h.p. cap., 35-tons. These compressors absolutely first class condition; inspection invited; may be purchased individually. Details by writing Box AP-7, c/o Industrial Refrigeration.

FOR SALE
York 8-cyl. 3-¾ x 3 Y40 ammonia compressor.
Duplex 9x9 York w/150 h.p. motor.
10 x 7½ York and 8x6 York Model D-8 boosters.
7½ x 7½ York w/V-belt drive to 50 h.p. motor.
5x5 and 4x4 York Model D-8 compressors.
5x5 and 4x4 York self-contained units.
Two 6'x16" coded receivers w/valves.
15" x 7' York Multi-pass condenser.
Condensers, receivers, motors, etc.
JOHN F. CARSON
A & Venango Sts., Philadelphia 34, Pa.
GArfield 6-2221

USE CLASSIFIED ADS REGULARLY

USED EQUIPMENT—continued

FOR SALE—New performance for old compressors . . . better performance for new ones. See the Ball Valve Company ad on page 55.

FOR SALE—ICE RINK EQUIPMENT. Complete equipment used a few weeks only from the time it was installed new, including Worthington Model 6 JF-4 V-type, 4-cylinder, 6" stroke, for use with Freon, compressor, cap. 66 tons at 5° suction, 95° condensing, self-contained with 100 h.p. 60/220/3/1800 r.p.m. Also Worthington Type CDS-175 condenser, Acme 30"x11' brine cooler, oil separator, G.E. panel-board controls, Worthington brine pump, 500 gph cap., etc. All mounted on one trailer truck, practically new; was used for ice skating rink, and has many other uses. Owners must sell. Address Box AP-6, c/o Industrial Refrigeration.

FOR SALE—Ice Crane. Three motor—3 BDS double girder ice crane floor operated. Span 25' 11", capacity 1½ tons. Bridge construction: 2-12" I beams. Bridge travel: 3½h.p. V/S motor mounted in center of crane; trolley: 1½ h.p. variable speed control. Hoist: 2-A type "H" A.C. hoist with single speed control 8' lift. 2 strands ⅜" cable used. Current: 440-3-60, serial No. 6811E. Detroit Hoist & Machine Co. Write The Terminal Cold Storage & Ice Co., 20-60 Eaker St., P.O. Box 156, Dayton 1, Ohio.

FOR SALE
Synchronous Motors, NEW engine-type,
440 volt with EM line starters,
125 hp EM 277 r.p.m. 80% PF
150 hp F-M 327 r.p.m. unity PF.
49- new 5 can baskets for 11"x22" cans.
Air agitation equip. for 384 cans.
1-ton Vilter Pakicer new, 1 ton bin, 3 hp condensing unit.
Misc. new and used refrigeration equipment.
RALPH E. MANNS CO.
1030 E. Anaheim St. Wilmington, Calif.

FOR SALE—1949 Model Frick 6x6 ammonia compressor, cap. 15-ton, operating at 15.7 suction pressure, price $1500 possibly less; also in same plant is York 7½ x 7½ cap., 19-ton, at 15.7 suction pressure, operating at 275 r.p.m. Both units complete with motors, starters, accessories; also 11x6x5 brine tank, 330 cu. ft and 280 sq. ft. of coils; miscellaneous diffusers, etc. Individual items can be purchased; all hooked up in small plant in eastern Pennsylvania. Immediate delivery at bargain price; inspection invited; subject to prior sale. Address Box AP-8, c/o Industrial Refrigeration.

FOR SALE
4—10"x10" 4-cyl. York duplex D.C. to 225 h.p. motor.
2—10"x10" 2-cyl. Frick D.C. to 100 h.p. motor.
2—10"x10" 2-cyl. York D.C. to 100 h.p. motor.
3—9"x9" 2-cyl. York D.C. to 75 h.p. motor.
1—7¼"x5" Frick booster.
2—7½"x7½" 2-cyl. York compressors.
1—6"x6" Frick 2-cyl. compressor.
1—5"x5" York 2-cyl. compressor.
1—3"x3", 1—4"x4", 1—5"x5" condensing units.
11"x22"x47" — 11"x22"x51" ice cans.
20—100-ton ice plants, York and Frick.
1—3¼"x3" 8-cyl. V/W York belt driven ammonia compressor.
1—5¼"x4¼" 6-cyl. V/W York ammonia booster compressor.
1—6¾"x5" 6-cyl. V/W York booster ammonia compressor.
1—25-ton Chrysler Air tem. Freon condensing unit, complete.
1—40-ton General Electric Freon condensing unit, complete.
1—50-ton General Electric Freon condensing unit, complete.
1—50 ton Buffalo Freon evaporative condenser.
ENTERPRISE EQUIPMENT CORPORATION
79 Alexander St., Yonkers, N. Y., Box 502
Cable: ENEQCO — Phone Yonkers 8-8118-9

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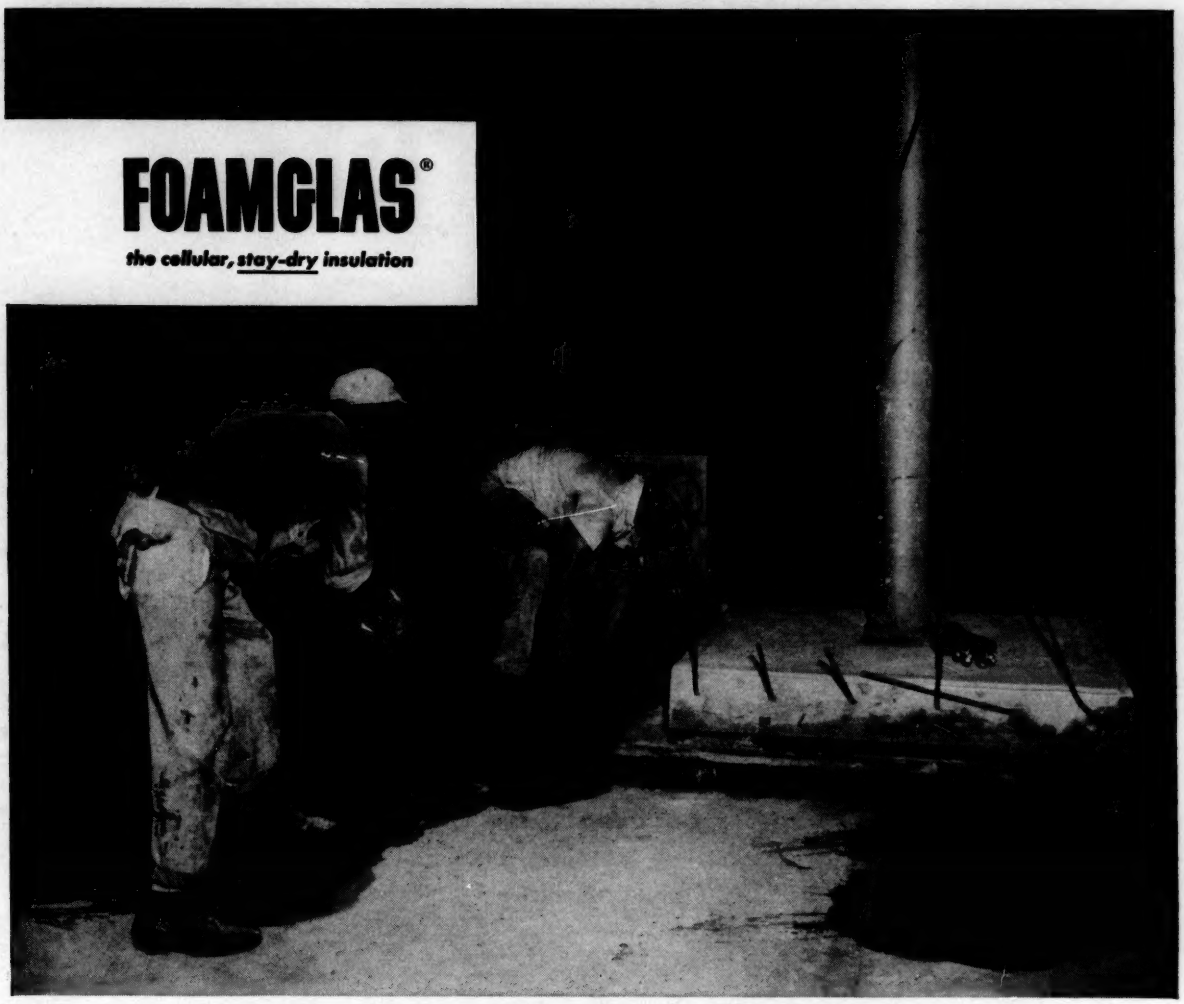

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